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The Gas Appliance Testing Laboratory—Part III

Care and Maintenance of Equipment—Calibration and Use of Thermometers—Useful Tables of Constants and General Laboratory Data

By H. M. RILEY and L. B. WILSON, JR.

Consolidated Gas, Electric Light and Power Company of Baltimore, Baltimore, Md.

Except for one or two specific cases, it is rather difficult to prescribe definite rules and directions for taking the proper care of the laboratory equipment.

The men will do well to keep in mind the thought that the equipment must not be subject to neglect as regards upkeep and maintenance. Those portions of the equipment which are subject to deterioration and wear must be given constant attention. This is especially true of such parts as the valves and cocks, which should be frequently greased to insure against leakage and to make possible their easy operation. The flexible hose connections which have been suggested as desirable for the temporary connection of appliances under test, also require frequent attention to obviate the possibility of leakage either in the hose or at the end connections.

It seems sufficient to call brief attention to the necessity of general inspection and care of the equipment, as the competent laboratory man will readily realize that neglect of this feature will seriously interfere with the production of accurate work.

There are, however, two pieces of apparatus which, because of their constant use and the fundamental requirement of extreme accuracy, are worthy of special mention. We refer to the test meter and to the laboratory thermometer.

The Meter

As has already been stated, the measurement of gas should be made by means of the laboratory wet type meter. Suggestions have already been offered as to the proper method of installation.

The wet meter is the most accurate type available, but its degree of accuracy is entirely dependent upon the constant maintenance of a proper water level. This water level may be observed by means of the water line gauge, it, of course, being necessary to have the meter level, as indicated by the spirit levels attached to it.

In order to ascertain the correct water level, the meter should be tested or bottled with a standard cubic foot bottle at least once every six months. The method of bottling the laboratory meter is precisely the same as the method used in bottling or calibrating the service meter prover, and the reader is advised to consult the rules for this procedure as published by the Bureau of Standards or the American Gas Institute.

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The proper water line having been determined upon, it is good practice to be sure that this condition is maintained by a daily observation of the water level in the water line gauge glass. Evaporation of the water, and other conditions to which the meter is subjected, make this constant care essential. Too high a water level will cause the meter to read fast, and too low a level will cause it to read slow.

In order to ascertain that there is no leakage through the drum of the meter, gas should be allowed to pass through it very slowly, say, at the rate of one-tenth cubic foot per hour for one complete revolution of the drum. The stopping of the drum without interference with the flow of gas, which for convenience may be burned at a pilot tip, will indicate the existence of a leak through the drum. This test also should be made every six months.

Removing and Filtering Water

The water in the laboratory meter should be removed about once each month, because of the gradual accumulation of solid foreign matter. The water thus drained off should be carefully filtered to remove this solid matter and utilized again for filling the meter. The advantage of this practice is obvious to any one familiar with gas test work. This water is saturated with gas, and will not produce a change in the characteristics and quality of gas, which will occur to a more or less extent where unsaturated water is used.

Thermometers—Their Calibration and Use

Before water is returned to the meter, a small quantity of sperm oil (1 gill of oil to a 400 cu. ft. per hour meter) should be introduced into the meter. This oil will float upon the surface of the water, thus lubricating the bearings of the drum.

Too much care cannot be exercised in the calibration and maintenance of the laboratory meter.

As has been observed in a previous article under

TABLE NO. 1—CORRECTION FACTORS FOR TEMPERATURE AND PRESSURE TEMPERATURE (DEG. FAHR.)

Barometer	40	45	50	55	60	65	70	75	80	85	90	95
29.00	1.014	1.003	0.990	0.979	0.966	0.954	0.941	0.928	0.914	0.900	0.885	0.870
29.50	1.032	1.020	1.008	0.996	0.983	0.970	0.957	0.943	0.930	0.916	0.901	0.885
30.00	1.050	1.038	1.025	1.013	1.000	0.987	0.974	0.960	0.946	0.932	0.917	0.901
30.50	1.067	1.056	1.043	1.030	1.017	1.003	0.992	0.978	0.963	0.949	0.934	0.918

the caption of "Laboratory Equipment," one of the most useful pieces of apparatus in the laboratory, and one deserving especial care, is the thermometer. It has been suggested that the laboratory be provided with a thermometer which has been calibrated by the United States Bureau of Standards. Such a thermometer should be used only as a standard with which to calibrate the ordinary thermometers used in the regular testing work.

The use of the mercury thermometer is so general in the every-day life of all persons that doubtless most people believe themslves thoroughly conversant with its use; the following facts may, however, prove of interest and should certainly be given consideration in any testing work where accuracy is claimed.

1. In general, thermometers are graduated to read correctly when totally submerged. In calibrating a laboratory thermometer, then, the laboratory thermometer and the standard thermometer should be totally submerged.

2. In using a thermometer where it is impossible to apply the heat throughout its entire length, it is necessary to apply a correction, which has been termed a "stem correction." This correction is in addition to any which is found necessary by comparison with the standard thermometer. To determine this "stem correction" it is first necessary to observe the mean temperature of that portion of the mercury column which projects outside of the medium whose temperature is being observed, and which is therefore not subjected to the temperature of the medium. Thus, if that portion of the mercury column between the graduations for 200 deg. and 400 deg. projects outside of the medium whose temperature is being observed, it is necessary to attach a second thermometer to the first in such a position that the bulb of the second only comes in firm contact with the first thermometer at the mean position of the exposed column, which, in the illustration cited, will be at the 300 deg. graduation.

The proper stem correction is then found by substituting in the following equation:

$$\text{Stem correction} = 0.000085 \times n(T - t)$$

0.000085 = The difference between the coefficient of expansion of the mercury and of the glass in the stem.

n = Number of degrees of the mercury column which project outside of the medium.

T = Observed temperature of the thermometer.

t = Mean temperature of the exposed portion of the mercury column.

Where the medium whose temperature is being observed is higher than that into which the stem of the thermometer projects, the "stem correction" factor will be positive and should obviously be added to the observed reading, and conversely, where the medium whose temperature is being observed, is lower than that into which the stem projects, the "stem corection" factor will be negative and should be deducted from the observed reading.

In calibrating a laboratory thermometer against a standard thermometer, both should be totally submerged in a suitable receptacle containing melting ice, the temperature of the contents of the container gradually being brought up to the boiling point and simultaneous readings on both thermometers being taken every two degrees.

TABLE NO. 2—INCHES OF WATER AND MERCURY EQUIVALENTS

Inches Water	Inches Mercury
2.0	0.15
2.5	0.18
3.0	0.22
3.5	0.26
4.0	0.29

The standard correction factor for a thermometer at different temperatures is the observed difference in the reading during calibration between that thermometer and the standard thermometer.

TABLE NO. 3—BAROMETRIC CORRECTION FOR VARYING TEMPERATURE

Temperature	Correction (Deduct)
50 deg. Fahr.	0.06 in.
60 deg. Fahr.	0.09 in.
70 deg. Fahr	0.11 in.
80 deg. Fahr.	0.14 in.
90 deg. Fahr.	0.17 in.

In calibrating a thermometer for temperature readings in excess of 212 deg. Fahr., it is, of course, necessary to use some liquid whose boiling temperature is higher than that of water.

Where it is impractical to calibrate with total submergence, the laboratory thermometer and the standard thermometer should be suspended in the liquid so that the length of exposed mercury column in each extends over the same temperature graduations, thus eliminating the consideration of "stem correction" during the process of calibration.

In the well-regulated laboratory, each thermometer will be designated by a distinct mark or number etched on the stem or appearing on a tag attached to the stem. By this means the calibration data for each thermometer may be recorded in a notebook which is especially maintained for this purpose.

For the convenience of the laboratory man, the following table, showing a comparison of the different thermometer scales, is presented:

	Fahr.	Cent.	Reaumur
Absolute zero	—459.64	—273.13	—218.51
Freezing point	32	0	0
Maximum density of water	39.1	3.94	3.15
Boiling point	212	100	80

Readings on the Fahrenheit, Centigrade or Reaumur scales are readily convertible by substitution in the following equations:

$$F = \frac{9}{5} C + 32 \text{ deg.} = \frac{9}{4} R + 32$$

$$C = \frac{5}{9} (F - 32 \text{ deg.}) = \frac{5}{4} R$$

$$R = \frac{4}{9} (F - 32 \text{ deg.}) = \frac{4}{5} C$$

Tables of Constants and General Laboratory Data

The fashion, whereby men mold their mental accomplishments along encyclopædic lines, is rapidly becoming a thing of the past. Particularly is this so of engineering and technical endeavor. It is seldom that we encounter, at least in practical work, the engineer who is able to quote from memory physical constants and basic data of a general nature, and doubtless this state of affairs is anything but pleasant to the old-time pedagogue, whose estimate of brain power was formed by the amount of dates, figures and constants one was able to absorb.

In this present day of virile progress the engineer is too much occupied with live problems to attempt to memorize any but a few fundamental facts. In short, he is willing, and indeed thankful, to be able to refer to standard handbooks for the information sought, and not trust his memory. On the other hand, it is vitally essential that one be able to correctly apply the data found in tables, etc., and it is hence thought opportune to tabulate some of the most important data referred to by the laboratory man in the course of his tests and subsequent calculations, and at the same time illustrate the use of this data by way of mathematical examples.

Temperature and Pressure Correction Factors

As a general proposition, in calculating the problems of the laboratory, the amount of gas used is referred back or corrected to the basis of 60 deg. Fahr. temperature and 30 in. barometric pressure.

Such a procedure is necessary, as the standard cubic foot specifies these standard conditions, and unless this correction is applied the final calculations will be faulty and give results that cannot be used on a comparative basis.

Table No. 1 shows some correction factors for temperature and pressure and Table No. 2 gives data for converting inches of water gas pressure to inches of mercury. In this connection it might be stated that only a few of the factors are given, since a more complete list can be procured from the various companies manufacturing laboratory equipment. Also there should be a complete set of this data framed and hung conveniently in the laboratory for reference.

Hence, assuming that one had observed a reading of 50.5 cu. ft. of gas at 60 deg. Fahr. and 2.0 in. water pressure, 30.45 barometer and 65 deg. Fahr. room temperature, the procedure for ascertaining the corrected volume would be as follows:

Deduct 0.10 in. (Table No. 3) from 30.45, giving 30.35.

Add 0.15 in. (Table No. 2) to 30.35, giving 30.50.

Observe in Table No. 1 factor corresponding to 60 deg. and 30.50 barometer, same being 1.017.

Next multiply 50.5 by 1.017, giving a corrected volume of 51.36 cu. ft.

Chemical Data

Tables of chemical constants are of great help in aiding the laboratory men to quickly make calculations along this line. Table No. 4 gives some figures which are useful in working out flue gas problems and the like:

Application of Table 4: Ten cubic feet of gas containing the following constituents:

7 cu. ft. CO
2 cu. ft. H^2
1 cu. ft. CH^4
} are completely burned.

Find products of combustion.

$CO = 7 \times 1 = 7$ cu. ft. CO^2
$7 \times 1.90 = 13.3$ cu. ft. N^2
$H^2 = 2 \times 1 = 2$ cu. ft. H^2O
$2 \times 1.90 = 3.8$ cu. ft. N^2
$CH^4 = 1 \times 1 = 1$ cu. ft. CO^2
$1 \times 2 = 2$ cu. ft. H^2O
$1 \times 7.62 = 7.62$ cu. ft. N^2

Hence, products of combustion are:

$CO^2 = 7 + 1 = 8$ cu. ft.
$H^2O = 2 + 2 = 4$ cu. ft.
$N^2 = 13.3 + 3.8 + 7.6 = 24.7$ cu. ft.

Table 5 shows the weights of the gaseous elements and compounds usually encountered in the laboratory work.

Table No. 4—Combustion Data

Combustible	Volume (Cu. Ft.)	Cu. Ft. O^2 Needed to Burn	Cu. Ft. Air Needed to Burn	Products of Combustion (Cu. Ft.) CO^2	H^2O	N^2	Chemical Reaction
CO	1	0.5	2.40	1	..	1.90	$2CO + O^2 = 2CO^2$
C^2H^4	1	3.0	14.42	2	2	11.42	$C^2H^4 + 3O^2 = 2CO^2 + 2H^2O$
CH^4	1	2.0	9.62	1	2	7.62	$CH^4 + 2O^2 = CO^2 + 2H^2O$
H^2	1	0.5	2.40	..	1	1.90	$2H^2 + O^2 = 2H^2O$

TABLE NO. 5—WEIGHT OF 1 CU. FT. OF DRY GASES AT 60 DEG. FAHR. AND 30 IN. BAROM.

Gas	Formula	Weight (Ounces)
Air	$0.792\ N^2 + 0.208 O^2$	1.222
Oxygen	O^2	1.351
Nitrogen	N^2	1.185
Hydrogen	H^2	0.085
Water vapor	H^2O	0.764
Carbon monoxide	CO	1.195
Carbon dioxide	CO^2	1.857
Methane	CH^4	0.678
Ethylene	C^2H^4	1.195

Application—50 cu. ft. of CO gas measured at 60 deg. Fahr. and 30 in. barom. are completely burned and an analysis of the products of combustion shows 25 per cent CO^2, find volume of product of combustion.

Assume V = volume of products of combustion (cu. ft.).

Then 0.25 V = cu. ft. CO^2.

$$\text{Carbon in } CO^2 = \frac{12 \text{ oz.} \times 1.857 \frac{\text{oz.}}{\text{cu. ft.}} \times 0.25 \text{ V. cu. ft.}}{44 \text{ oz.}} \text{ oz.}$$

$$\text{Carbon in CO gas} = \frac{12 \text{ oz.} \times 1.195 \frac{\text{oz.}}{\text{cu. ft.}} \times 50 \text{ cu. ft.}}{28 \text{ oz.}} \text{ oz.}$$

$$\text{Equating } \frac{12 \times 1.857 \times 0.25\ V}{44} = \frac{12 \times 1.195 \times 50}{28}$$

Whence V = 202 cu. ft.

NOTE: $\frac{12}{44}$ = per cent of C in CO^2, since mol. wt. of CO^2 is 44 and atom. wt. of C is 12.

Also $\frac{12}{28}$ = per cent C in CO, since mol. wt. of CO is 28 and atom. wt. of C is 12.

THERMAL TABLES

Table No. 6 shows the boiling points of water at various barometric pressures.

TABLE NO. 6—BOILING POINT OF WATER

Barom.	Boiling Point (Deg. Fahr.)
29.0	210.42
29.2	210.76
29.4	211.10
29.6	211.44
29.8	211.79
30.0	212.13
30.2	212.47
30.4	212.81
30.6	212.97

Application of Table 6—The laboratory thermometer reads 30.34 and the room temperature is 80 deg. Fahr., find corrected boiling point of water.

By consulting Table 3 we find a deduction of 0.14 in. to make to the barometer reading, giving 3.30, whence the corrected boiling point is found from Table 6 to be 212.47 deg. Fahr.

Table 7 gives the heat units in 1 pound of water at different degrees of temperature, and in this connection, although it is the general practice to ascertain the heat units by deducting 32 deg. Fahr from the temperature at which the data is desired, nevertheless we do not feel that we are straining a point for the sake of accuracy in advising the use of the data contained in this table.

TABLE NO. 7—HEAT UNITS (B.t.u.) PER POUND OF WATER

Temp. (Deg. Fahr.)	B.t.u. per lb.
32	0.00
40	8.05
50	18.08
60	28.08
70	38.06
80	48.03
90	58.00
100	67.97
110	77.94
120	87.91
130	97.89
140	107.87
150	117.87
160	127.86
170	137.87
180	147.88
190	157.91
200	167.94
210	177.99
220	188.11

Application—1,000 lb. of water are heated from 60 deg. Fahr. to 180 deg. Fahr. How many B.t.u. have been added?

B.t.u in 1 lb. of water at 180 deg..	147.88
B.t.u. in 1 lb. of water at 60 deg...	28.08
B.t.u. added to 1 lb.....	119.80
B.t.u. added to 1,000 lb.....	119,800.00

In Table 8 are given the specific heat of some gases, and here, too, we favor the use of these figures rather than those usually given as a round number.

TABLE NO. 8—SPECIFIC HEAT OF SOME GASES (CONSTANT PRESSURE)

Gas	Specific Heat	
Hydrogen	.0189 + .0000017 t	B.t.u. per Cu. Ft.
Nitrogen	.0189 + .0000017 t	
Oxygen	.0189 + .0000017 t	
Water vapor (H^2O)	.021 + .000005 t	
Carbon monoxide (CO)	.0189 + .0000009 t	
Carbon dioxide (CO^2)	.023 + .000008 t	
Methane (CH^4)	.0237 + .000008 t	
Ethylene (C^2H^4)	.0287 + .000008 t	

Note—From J. W. Richards' Metallurgical Calculations. Vol. I.

Application—Find B.t.u. in 1 cu. ft. of carbon dioxide at a temperature of 82 deg. Fahr. (1 cu. ft. measured at 60 deg. Fahr. and 30 in. barometer).

$[0.023 + 0.000008 \times (82 - 32)]\ (82 - 32) = 1.17$ B.t.u.

TABLE NO. 9—SPECIFIC HEATS BOILING POINT AND LATENT HEAT OF VAPORIZATION AT 30 IN. BAROM. OF SOME LIQUIDS

Liquid	Sp. Ht. (per Lb.)	L. H. V. (per Lb.)	B. P.
Alcohol (C^2H^6OH)	0.70	385 B.t.u.	172 deg. Fahr.
Benzol (C^6H^6)	0.43	169 B.t.u.	176 deg. Fahr.
Gasoline	0.70		
Glycerine	0.58		
Kerosene	0.50		
Machine oil	0.40		
Mercury	0.033	122 B.t.u.	673 deg. Fahr.
Paraffin oil	0.52		
Petroleum	0.50		
Turpentine	0.47	126 B.t.u.	

Application—In a certain industrial operation, 500 lb. of mercury at 60 deg. Fahr. are evaporated and sublimed. How many B.t.u. are usefully used in heating and evaporating the mercury?

673 — 60 = 613 deg. Fahr. rise in temperature to boiling point.

613 × 0.033 = 20.23 B.t.u. per pound.

20.23 × 500 = 10,115 B.t.u. needed to raise mercury to boiling point.

122 × 500 = 61,000 B.t.u. needed to evaporate mercury.

Total 71,115 B.t.u. needed.

TABLE NO. 10—SPECIFIC HEATS, MELTING POINT AND LATENT HEAT OF FUSION OF SOME SOLIDS

Solid	Sp. Ht.	L. H. F.	M. P.
Aluminum	0.222	150 B.t.u.	1220 deg. Fahr.
Copper	0.094	76 B.t.u.	1985 deg. Fahr.
Lead	0.030	9.5 B.t.u.	638 deg. Fahr.
Silver	0.056	42 B.t.u.	1730 deg. Fahr.
Tin	0.052	26 B.t.u.	450 deg. Fahr.
Zinc	0.092	50 B.t.u.	788 deg. Fahr.
Beeswax		75 B.t.u.	144 deg. Fahr.
Paraffin	0.65	63 B.t.u.	127 deg. Fahr.
Solder 50-50	0.043	24 B.t.u.	420 deg. Fahr.
Coal	0.32		

Application—Find heat used in heating 10 lb. of paraffin from 70, and melting same.

(127 — 70) 0.65 × 10 = 360.5 B.t.u. for raising to M.P.

63 × 10 = 630.0 Bt.u. for melting

Total B.t.u. used 990.5

TABLE NO. 11—PRESSURE CORRESPONDING TO INCHES OF MERCURY

Inches Mercury	Pressure Lb. per Sq. In.
1	0.5
2	1.0
3	1.5
4	2.0
5	2.5
6	2.9
7	3.4
8	3.9
9	4.4
10	4.9
15	7.5
20	9.8
30	14.7
40	19.6

As an illustration for the use of the above, assume it is desired to find the steam pressure on a gasteam radiator by means of a mercury filled gauge and which reads 9 in. From Table No. 11 the steam pressure (gauge) will be found to be 4.4 lb. per square inch.

DATA FOR CALCULATING MOISTURE IN AIR

TABLE NO. 12—MAXIMUM TENSION OF AQUEOUS VAPOR

Temp. Deg. Fahr.	Max. Tension In. Mercury	Temp. Deg. Fahr.	Max. Tension In. Mercury
30	0.18	130	4.51
40	0.26	140	5.87
50	0.36	150	7.47
60	0.52	160	9.67
70	0.74	170	12.26
80	1.03	180	15.34
90	1.42	190	19.11
100	1.93	200	23.52
110	2.59	212	30.00
120	3.45		

Application of Table No. 12—Assume 1,000 cu. ft. of dry air are needed for a certain purpose and the humidity is 60 per cent, temperature of air 80 deg. Fahr. barometer 30.10. Find moisture accompanying air. Maximum tension at 80 deg. Fahr. 1.03 in.

$$\frac{30.10 - 1.03}{30.10}\ y = 1{,}000$$

y = 1,035 cu.ft. of air and water vapor.

1,000

35 cu.ft. of water vapor at 100 per cent humidity.

35 × 0.60 = 21 cu. ft. of water vapor accompanying air.

TABLE NO. 13—RELATIVE HUMIDITY, PER CENT

	Difference Between Dry and Wet Bulbs, Deg. Fahr.									
Dry Temp.	1	2	3	4	5	6	7	8	9	10
32	89	79	69	59	49	39	30	20	11	2
40	92	83	75	68	60	52	45	37	29	23
60	94	89	83	78	73	68	63	58	53	48
80	96	91	87	83	79	75	72	68	64	61
100	96	93	89	86	83	80	77	73	70	68

Hence, if our room temperature is 80 deg. Fahr., and the wet thermometer reads 8 deg. lower than the dry thermometer, our relative humidity is 68 per cent.

STEAM TABLE

Below is given a steam table of data which is indispensable to the work of the laboratory in carrying out calculations on steam boilers and the like.

TABLE NO. 14—SATURATED STEAM DATA (FOR 1 LB. OF STEAM)

Pressure Lb. Abs.	Temp. Deg. Fahr.	Heat of the Liquid B.t.u.	Latent Heat of Vap. B.t.u.	Total Heat B.t.u.
1	101.8	69.8	1034.6	1104.4
5	162.3	130.1	1000.3	1130.4
10	193.2	161.1	982.0	1143.1
15	213.0	181.0	970.0	1151.0
20	228.0	196.1	960.0	1156.1
25	240.0	208.4	952.0	1160.4
30	250.3	218.8	945.0	1168.8
35	259.3	227.9	939.0	1166.9
40	267.3	236.1	933.0	1169.1

Application—100 lb. of water are evaporated and the gauge reads 5.3 lb. pressure. Find heat usefully used in doing this work.

5.3 lb. gauge.
14.7 lb. atmospheric pressure.

20.0 lb. absolute.

By consulting the table we find the total heat given as 1,156.1 B.t.u. per pound, which is made up of B.t.u. necessary to raise 1 lb. from 32 deg. Fahr. to 228 deg. Fahr. and the B.t.u. necessary to evaporate it at this temperature of 228 deg. Fahr.

$1{,}156.1 \times 100 = 100{,}561$ total B.t.u. usefully used.

However, if the water was at an initial temperature of 60 deg. Fahr. before applying the heat, it would already contain 2,808 B.t.u. (see Table No. 7), which should be deducted from 100,561 B.t.u. to give the net B.t.u. usefully used, or 97,753 B.t.u.

Another very useful table on steam data is that containing information on superheated steam, same being found in Marks & Davis "Steam Tables and Diagrams."

TABLE NO. 15—HEAT VALUE OF VARIOUS FUELS AND COMBUSTIBLES

Fuel	Heat Value (B.t.u.)
Acetylene	1560 per cu. ft.
Acetylene	21470 per lb.
Benzine	17950 per lb.
Anthracite coal	12750 per lb.
Petroleum	19800 per lb.
Pine wood	9000 per lb.
Petroleum	147000 per gal.
Coal oil	112150 per gal.

The above data is valuable in permitting the laboratory man to quickly strike a comparison between the different kinds of fuel.

Table No. 16 gives the flow of gas through various sized orifices at varying pressures and is quite useful in enabling the laboratory man to quickly determine the proper orifice to use when a certain consumption is desired during the test of a particular appliance.

TABLE NO. 17—FLOW OF GAS (CUBIC FEET PER HOUR) THROUGH VARIOUS ORIFICES AT VARYING PRESSURES

Size Gauge	Diameter	Pressure (Inches Water) 2.0	2.5	3.0	3.5	4.0	4.5	5.0
70	0.0290	1.2	1.3	1.5	1.6	1.7	1.9	2.1
66	0.0330	2.1	2.4	2.5	2.7	2.9	3.2	3.4
62	0.0380	3.1	3.5	3.8	4.2	4.4	4.6	4.9
58	0.0420	3.8	4.1	4.5	5.0	5.3	5.6	5.9
54	0.0550	6.2	7.4	8.1	8.8	9.4	10.0	10.5
50	0.0700	10.9	12.1	13.2	14.5	15.6	16.1	17.3
46	0.0810	14.7	16.3	17.6	18.9	20.2	21.4	22.6
42	0.0935	20.2	22.0	24.5	26.0	27.6	29.8	31.6
38	0.1015	21.9	24.2	26.5	28.5	31.9	33.8	35.3
34	0.1110	27.5	30.1	33.0	35.9	38.9	41.4	43.5
30	0.1285	34.6	38.7	42.3	45.9	48.0	51.3	54.2
26	0.1470	49.5	56.0	61.0	66.3	70.7	74.3	78.1
22	0.1570	55.4	62.0	68.0	74.1	78.2	82.9	87.8

The above table is based on gas with a gravity of 0.550 and the pressure is taken about 1 ft. back of the orifice.

In concluding the remarks on data, etc., for use in the laboratory, we cannot too strongly advise the men to take advantage of every opportunity to gather and retain in convenient form any data that they come in contact with or notice in any of the technical journals or text books. A very good reference book along this line is the text on "Physical Constants and Data," published by the Smithsonian Institute, Washington, D. C.

Purity of Product an Argument for Gas in Zinc Oxide Production Installations

Public Service Gas Company of New Jersey Secures Business in Face of Strong Oil Competition

An industrial fuel gas installation for the production of pure zinc at the plant of the New Jersey Chemical Company at Trenton has recently been secured by the Public Service Gas Company of New Jersey.

The installation consists of a brick furnace 19 ft. long, 6 ft. wide and 6 ft. 6 in. high, divided into three compartments separated by firebrick lined sliding doors.

The first compartment is a preheating chamber through which the products of combustion from the heating chamber pass on the way to the stack, giving a high economy in utilization of the waste heat. The second chamber is a heating zone containing two large graphite crucibles on a movable truck with a firebrick top. The crucibles are charged with 1,000 lb. each of pig zinc and brought up to 1,600 deg. Fahr., which vaporizes the zinc. The vapor is then brought into contact with oxygen, forming powdered zinc oxide, which is sucked through large galvanized pipes and deposited in linen bags hung from the ceiling of the reclaiming warehouse. The zinc oxide made by this process is chemically pure, a condition which cannot be secured with the use of any other kind of fuel.

The gas company had to meet unusual oil competition. The Gulf Refining Company's station is located within 500 ft. of the furnace, and this company offered to pump oil directly from their tanks through an oil meter to the furnaces.

The plant is operated by a 15-hp. gas engine and has outside gas arc lighting.

Pumping Oil In Cold Weather

During cold weather we experienced considerable difficulty in pumping oil from the railroad spur to the gas works through about a quarter of a mile of 4-in. pipe. In order to cut down the pipe friction a valve was placed on the intake of the pump so that a certain quantity of air was admitted with the oil. This reduced the volume of oil in the pipes and the friction enough so that the pump could handle the oil without excessive pressure. This device saved the installation of a steam boiler to heat the oil.—*Wrinkle Dept. P. C. G. A.*

Emergency Cutting and Welding

A 16 x 24-in. nipple was all that was on hand (threaded both ends). Much time and expense would be spent to obtain a 16 x 18-in. nipple that was necessary to finish job. An oxy-acetylene welding and cutting outfit was handy; two cuts were made, 6 in. apart, in center of nipple. The two threaded pieces, 9 in. long, were then butt welded together, making nipple of desired length for small cost. The time consumed was one hour and thirty minutes.—*Wrinkle Dept. P. C. G. A.*

Properly Run Organization Required for Safety Work and Accident Prevention in Gas Companies

Edward L. Davies Emphasizes Need of Employee Education by Citing Thirty-Three Year Accident History of One Company, which Shows 81 Per Cent of the Accidents were Due to Gross Carelessness of Employees

It is the experience and opinion of the writer that safety work and accident prevention in gas companies requires a carefully worked out and properly run safety organization, as much if not more than the careful guarding of machines and the installation of safety devices at the works and in the field, declared Edward L. Davies, superintendent of the gas department of the Queens Borough Gas & Electric Company, of Far Rockaway, N. Y., in a paper presented at the recent annual Safety Congress held in New York City.

Previous papers on this subject have carefully tabulated the causes of accidents in the gas industry from a large amount of widely secured data. I simply wish to add a word to these figures.

My investigation shows that, in a company sending out 400,000,000 ft. of gas a year, of the forty-two accidents occurring from Jan. 1, 1915, to Aug. 1, 1917, thirty-four, or 81 per cent, were directly due to the employees gross carelessness, which tends to show the value of education to the employees, which can only be carried on by the constant watchfulness of the foreman or superintendent, aided by a well-organized safety organization.

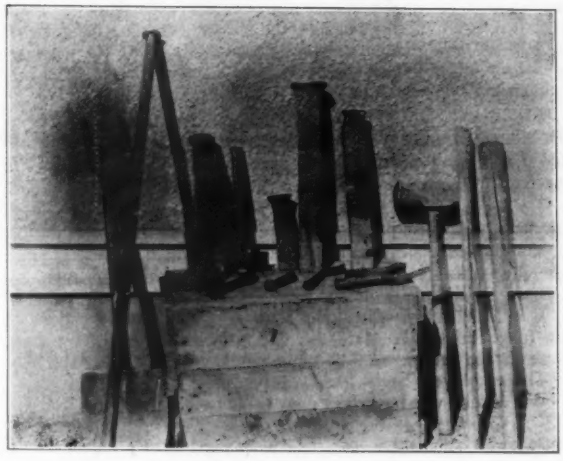
Organization Applicable to Any Size Gas Company

The safety organization of the company with which I am connected, and which we can highly recommend, is, with a few exceptions, of the familiar type approved by the National Safety Council, and I believe it is applicable to almost any size gas company. It consists of a central safety committee, made up of the operating officials of the company. The committee has a chairman and secretary, and careful minutes are kept of its proceedings at meetings.

To this committee reports a committee of safety and sanitation, consisting of three employees, which is active for three months, a new one being appointed at the end of this time, generally with its chairman appointed from the previous committee. These men, when appointed, are given a handsome safety button with the company's name inscribed, as a reward of their appointment.

Does Not Employ Safety Inspector

The company does not employ a safety inspector, as is done by many companies, this changing committee taking an inspector's place. I consider this a better plan, as this way a total of twelve men inspect the properties every year, and many good safety men are available in every company if they are selected for their carefulness and common sense. We do, however, appoint a fire inspector, as fire apparatus, such as extinguishers, etc., needs more constant inspection and care.



TYPICALLY DANGEROUS TOOLS

It is the duty of this committee to make an inspection of all the company's properties during its term, and to make a written report. This report is gone over carefully by the central committee, and a joint meeting of the two is then held and the various suggestions discussed and passed on, and a list of the approved items sent to the various department heads to be executed. The succeeding committee is provided with a copy of this report, so that they will not list again suggestions already made.

Investigation of Accidents

Another very important duty of this committee is to investigate all important accidents occurring in the company, and to make a report, in writing, with a recommendation for preventing a re-occurrence. Such reports are posted.

These investigations are ordered by the central committee. We have found this particularly valuable, as the employees know that if they are the cause of an accident, attention is directed toward them. We have also been surprised to find that the employee takes the committee's criticism in better spirit than he does that coming from an official.

A good example of a report is an accident which occurred a few years ago, when a derrick which was lowering a 16-in. pipe into a street trench slipped, dropping the pipe a few inches and badly crushing an employee's foot. Immediate investigation by the safety committee showed that there were no spikes on the feet of the derrick, which caused its slipping. Recom-

mendation that same be installed was made, approved and complied with, the result being that we have not had a similar accident since. This accident was due to lack of safeguard on company's part.

A report of an accident of the other type follows, the bulletin being quoted:

"On Aug. 18, 1915, at 1 p. m., William Smith, gas fitter, answered a complaint of 'no gas' at No. 7 Boulevard, Rockaway Beach.

"The meter was located under the first floor, which is about 4 ft. above the ground. This space was piled high with lumber and odd material. Smith crawled in the enclosure, and with difficulty finally reached the meter. As it was dark, *he lighted a candle, which he carried with him, as his electric torch was broken. He had not reported this to the office, but had instead purchased the candle.*

"He placed the lighted candle about 8 ft. from the meter on some lumber, within a few inches of the under side of the floor, and then proceeded to remove the plug and clear the service.

"Before he could put the plug back, the gas had completely filled the enclosure, particularly the upper part of it, was ignited by the lighted candle, and the explosion which followed badly burned Smith and set the lumber on fire, which, in turn, set the entire building in flames

"It is hardly believable that a man in our employ should so far forget his rules as to use a lighted candle or other open flame in the presence of live gas.

"The employee, Smith, was discharged.

"We do not want careless men in our employ."

These committee accident reports are posted on bulletin boards provided for this purpose, and the posting of other company bulletins and the National Safety Council bulletins. Where the accident is caused by such gross carelessness as to warrant the dismissal of the employee, this is noted, followed by the slogan: "We do not want careless men in our employ." The boards are located conspicuously at all the properties, including our show rooms, the latter being headed with the following placard: "It is the company's constant endeavor to protect and safeguard its employees from accidents and sickness. We respectfully ask the interest and co-operation of our customers."

Co-operation of Public

It is surprising to see the interest manifested by the public in our safety campaign, which is largely attained by these public bulletin boards. Announcements of safety meetings are posted on the boards, and at most of these meetings fully 25 per cent of the audience are persons in no way connected with the company, showing the public interest.

The safety committee also has charge of the monthly meetings of the employees and their families, which are held in the company's auditorium in the evening, at which time motion pictures are shown, a few comedy films being given between the safety and educational films. During the evening, a talk of about ten minutes is given on safety, bringing out in particular descriptions of any accidents occurring since the previous meeting, and a discussion of the lessons to be learned from them is held. The evening's program is closed with general dancing and light refreshments, provided by the company.

These meetings serve the double purpose of keeping the employees interested in safety work, and also of getting their families to think and talk safety in their homes, which we consider most important.

During the short talk, pictures with placards, such as the following, are thrown on the screen:

A picture of woman and child with placard:

"If you are injured, we are the ones who suffer."

We also hold other safety meetings once a month in the afternoon, on the company's time, at the gas works or store rooms, which all employees other than office men attend. They consist of demonstrations by employees picked at random of "First aid to those overcome by gas," demonstrations of mechanical respirators, and the use of the "First Aid Jar." Such meeting are usually attended by the company's physician, who, by the way, examines all men before they are employed.

Prize Stimulates Work

This covers the duties of the safety committee, and describes in a general way our safety campaign and organization, but I wish to mention a prize offered by the central committee every month, which we believe has greatly stimulated interest in safety work. A ten-dollar gold piece is awarded the employee who, in the opinion of the central committee, composes the best essay on safety work, a different phase being selected as the topic each month. At the end of the year the winners of the monthly prizes compete for a prize of $25. We believe that this tends to keep the safety idea constantly before the employees, and also interests the families, as they discuss their essays at home.

Doubts Value of Numerous Signs

I do not think a great number of signs posted conspicuously around a company's properties do much good, except when first put up or when the employee first sees them. I would have only a few, but have these very carefully selected. Examples of ones we consider particularly valuable are:

NOTICE TO MEN SEEKING EMPLOYMENT

Unless you are willing to be careful to avoid injury to yourself and fellow workman, do not ask for employment. We do not want careless men in our employ.

and another example—

Our Employees are forbidden to cross the tracks or trespass on the property of the Long Island Railroad Company, except at regular crossings.

Any violation of this rule will be deemed a willful intention on the part of an Employee to bring about injury or death to himself, under the Workman's Compensation Act. Any Employee who violates this rule will be discharged.

These signs, which are very large and conspicuously placed at our gates and crossings, are, with two or three others, the only ones we use.

Early Education

I wish to emphasize the importance of instructing a man in safety when he is employed. We consider it time and money well spent to have the new employee go over the bulletins of the previous year, which are kept on file for that purpose, and also to study carefully the company's rules. These are in printed form, each employee receiving one, and he is required to sign

a slip stating he is thoroughly familiar with them. Gross carelessness and repeated violation of these rules should always be followed by dismissal.

Every employee, except the common laborers, should have simple instructions in the use of the "First Aid Jar," which should be placed at all properties and on all company's wagons and trucks. Improper use of this jar may result seriously. It is of the utmost importance that these jars be properly maintained and kept clean at all times, which can only be done through the constant inspection of the foreman.

Most workmen when employed have a fair idea of the proper use of tools, but difficulty is found in having dangerous tools reported. This item and the use of goggles are constantly being called to our attention by the central bulletins.

Proper Lighting

Proper lighting is a matter to be closely followed, both in the works and shop, and also on consumers' premises. Instruct your men that under no conditions are they to work where the lighting is poor.

Poor housekeeping on the company's properties and in consumers' premises often results seriously. *This is particularly true where construction work is being carried on.* A large per cent of our accidents have been of men stepping on nails in boards left carelessly around.

Many accidents result from the careless piling of material, particularly pipe, in the works and street departments. It costs slightly more, but we think it pays, to pile it in tiers, alternate layers being at right angles, and alternate pipe lengths having bells and spigots at opposite ends. Piles should never be higher than 5 ft.

Gas Works Hazards

Left-handed gas valves (valves opening clockwise) should not be purchased or installed in the works' yard connections, and where they do exist they should be removed. If this is not practical, they should be tagged and a notation made on the yard connection plans. They are particularly undesirable in purifier connections, mixed up with right-handed valves. The writer knows of a case of a man being killed with gas in a purifier box, because a left-handed valve which was in connections with right-handed valves was thought closed, but was in reality open. When the exhauster was started the men in the box were overcome. I also saw one installed with a water gas set in the last six months, and the company is having it removed and a right-handed valve put in.

In many water gas generator houses, the buggies for coaling the generator are run up to it on rails. After a "coal-up" they are generally filled again, pushed from under the hopper and stand on the rails waiting to be used. A "dog" or derailer should be provided on the rail between the charging door and the buggy, which should be removed only when the generator lid is off. Or, the rails should decline sharply away from the lid. Both of these methods are to prevent the coal buggy from running down and striking the T-bar on the coaling lid and knocking the lid off.

The writer knows of a case of this kind happening during a "run," but, fortunately, no one was burned, the gas maker being able to reach the steam and oil manifolds and turn them off. Where rails are not used, careless manipulation of the coal buggy results in it often striking the lug which locks the cutter bar on the coaling lid. This weakens the catch and may finally break it, and the lid may come off.

Opening Fire and Ash Doors

In taking the lid off the generator, first crack it and see that gases are lighted, and I would call attention to the proper method of opening fire and ash doors on a generator. Unscrew the "T" screw bar, leaving the cutter bar in place. This will allow the door to be cracked an inch or so, and should any explosion take place the door would not be blown around on its hinges and strike someone, a case which the writer saw a number of years ago.

On some designs of water gas generators the cutter bar is horizontal, and the catch, if accidentally struck by a tool or bar, in the hands of a man passing, can be easily knocked off and the door opened. A small hole drilled through the catch and bar, and a small bolt on a chain dropped in it, will prevent such an accident occurring.

Before starting up a water gas set that has been shut down some time, the "down steam" should be turned on and the line drained out. If this is not done, and the "reverse" connections are turned over, closing the top hot valve and then this water of condensation is thrown on the fire, considerable pressure is suddenly developed, and this has been known to crack the generator head, although I never heard of any personal injury resulting.

The Greatest Hazard

The greatest hazard in the generator house is in cleaning the fire, especially in barring it down from the operating floor. This work, which is usually done by the common laborers around the works, should be carefully superintended and watched by the gas maker. The writer once saw a man pulled down with the bar after it had slipped through the fire and fall across the coaling bench, being very badly burned. When sledging bar, have it held with tongs.

Gauges on sets should be watched carefully for stoppages, as it is dangerous to operate set with these out of use.

Glasses should always be kept in sight cocks, and should not be cracked. Put this down as an item in your inspection when starting up a machine, and see that in horizontal sight cocks the rim holding the glass lifts up and not down when it is necessary to clean it. The writer knows of a case where an engineer operating a new set lost the sight of an eye by looking through a sight cock which had a piece of broken glass in it.

Tripping over tools in the generator and boiler rooms has been mentioned very often, but is of such importance that I wish to call attention to it again. Racks should be provided for these tools, and they should be kept in them when not in use. A good laborer in the clearing gang can be made responsible for this and the gas maker can see that he attends to it.

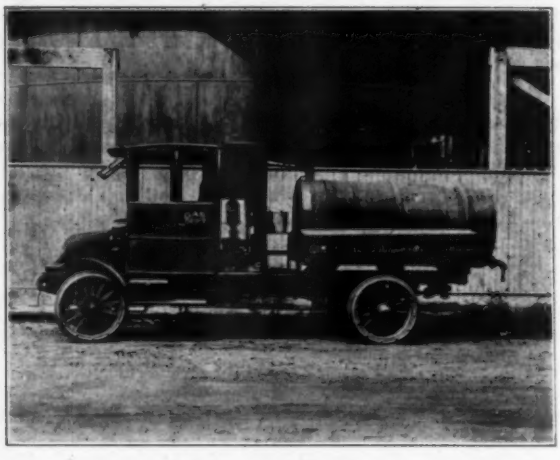
Never allow open flame lamps of any kind to be

brought or kept in works, and provide a generous supply of electric flash lights, and keep a supply of batteries at all times. A works should be thoroughly piped for gas lighting, but it should not be used unless the electric service is interrupted. In the exhauster and purifier rooms vapor-proof bulbs should be used, and the switch for turning them on should be outside of building.

In both coal and water gas works there are generally quite a number of galleries or balconies from which tools, coal or other material may drop. The use of toe boards and the covering up of any holes will largely prevent this, but the men should be taught *to pick up their tools after completing a job.* The writer once found an empty milk bottle, apparently used for drinking water, laying on its side on the outside sheet of the crown of a 2,000 M holder, and in a short time it would undoubtedly have rolled off to the ground.

Opening Purifier Boxes

With the installation of every water gas machine should go a set of directions. These should be framed



MOTOR-DRIVEN TRIP TRUCK USED

and hung on the operating floor and carefully followed, especially the directions for emptying the wash box when cleaning is necessary.

Blast main explosions are usually the result of carelessness in operating the set, as leaking blast valves are easily detected if the vent from the main is kept clear and is properly located for the gas maker's view. Many explosion heads in a main are desirable, and these should be guarded to catch flying pieces.

Purifier boxes should be opened as long before changing oxide or other purifier material as possible, and great care should be given to valves. I would never allow any one but the foreman to superintend the turning on or off of a box. In two-layer boxes which are on the ground level, remove the upper layer of oxide before opening the lower doors, to prevent it from catching on fire. This does not apply where boxes are elevated and have dumps from the bottom. Make it a rule that men are to leave all smoking articles in their lockers before going to work in or around an open box.

Frozen coal is another source of danger, as men unconsciously undermine large quantities, only to have it suddenly give way and fall on them. This is particularly true of broken anthracite coal used in generators.

Additional hazards in the coal gas plant are generally found in the retort house, where tiers of balconies and many floor or bench openings increase the danger.

Many accidents have occurred by the charging and discharging machinery catching men unawares. A complete and thoroughly understood signal system should prevent accidents of this type.

Fire Hazards

The liability of burns from charging and discharging doors is high in the retort house, as is also the chances of men being burned from hot coke and from steam when wetting coke down.

Most gas works are on or near railroad tracks, or at least have railroad sidings, and for this reason the chance of gas oil tanks catching fire from locomotives is very high, unless proper precautions are taken. See that all openings in tanks are securely covered, and from the top of each tank have an inverted vent with fine gauze over the opening.

These same railroad sidings often result in improper trespassing by company's employees, resulting in accidents, and besides warning all works men and having rules on the subject, large "No trespassing" signs should be conspicuously posted. Signs should state that violation will result in dismissal.

As the hazards found in boiler and engine rooms are those found in almost every plant generating steam and having machinery, and are therefore not characteristic of the gas business, I shall not take the time to go into them.

Shop and Street Hazards

In the distribution department we have the combined liability of accidents to our employees and to the public.

Accidents to one are often caused by the carelessness or lack of safeguards on the part of the other. Improperly operated automobiles, standing horses not tied, resulting in runaways, and work improperly done or guarded may result in injury to the public, and can be charged to the employee's carelessness. Poor housekeeping and lighting on the premises of our customers may cause injury to our men, while gross carelessness, and often curiosity regarding our work, by the public cause accidents to themselves.

Importance of Good Housekeeping

In a company operating motor cars and wagons, as most companies do, the liability is very high, and it is of the greatest importance that this work be carefully followed. See that the rolling stock leaves the garage or stable in proper shape, and wagons being provided with horns, tie-weights for the horses, etc.; the cars having tire chains, good brakes and horns, and being in good mechanical order. The rules of the road and company's rules on driving should be drawn up in

(NAME TO BE ENGROSSED HERE)

TO YOU, OUR FELLOW MEMBER OF PUBLIC SERVICE, WHO HAVE JOINED "THE COLORS", WE EXTEND OUR HEARTY GREETING.

YOU HAVE OFFERED YOURSELF FOR THE DEFENCE OF OUR COUNTRY AND OF THE PRINCIPLES UPON WHICH THE PROGRESS AND HAPPINESS OF HUMANITY ARE FOUNDED.

YOU HAVE LEFT LOVED ONES, FRIENDS AND CO-WORKERS, SO THAT THESE PRINCIPLES MAY BECOME A HERITAGE TO THEM.

WE, YOUR FELLOW WORKERS, ARE NOT INSENSIBLE TO THE SACRIFICES YOU HAVE ALREADY MADE, NOR TO THE ARDUOUS DUTIES THAT THE FUTURE WILL DEMAND.

THEREFORE, WE HERE EXPRESS A SMALL PART OF OUR APPRECIATION TO YOU, OUR FRIEND.

OUR THOUGHTS ARE WITH YOU AND, WHEN GREAT COURAGE IS NEEDED, MAY THIS EXPRESSION OF OUR LOVE AND CONFIDENCE STRENGTHEN YOU.

WE COMMEND YOU TO DIVINE CARE UNTIL YOU RETURN TO US—YOUR MISSION ACCOMPLISHED.

PRESIDENT.

PUBLIC SERVICE GAS

MESSAGE OF GOOD WILL TO THOSE WHO SERVE

A reproduction of the message of appreciation that is being sent to all the members of the Public Service Gas Company of New Jersey who have entered the service.

At the top of the message the American Flag and the Service Flag crossed, printed in colors, will appear. Under this emblem the name of the man will be engrossed. At the bottom the Public Service emblem will appear printed in red, blue and gold. The message will bear the signature of President McCarter.

pamphlet form and given to each driver, and he should be occasionally quizzed on them.

In the shops, store rooms and holder stations accident prevention is largely up to the man in charge of the property, because of the importance of good housekeeping. Safeguarding with railings and toe boards and proper care given to tools is not enough to prevent accidents, and they are bound to occur, particularly in outlying properties, if the man in charge is not an enthusiastic safety booster, and if he does not pay particular attention to good housekeeping.

Great care should be given the maintenance of even pressure in mains, and it should never be allowed to drop below a set minimum. This is especially true where a company has district governors feeding from the high pressure system into the low pressure, and where the irregularity of one governor may cause a drop in pressure in several districts. This drop in pressure will often extinguish the pilot lights on automatic appliances, and where this is not known, and the appliance is turned on, gas will escape. For this reason it is important to install flues with all automatic appliances. A drop in pressure may also be caused by the careless removing of a bag or stopper in a main or the lack of a necessary temporary by-pass. Such items are simply matters of good engineering practice, and with proper supervision should not occur.

Storage of Drippage

The pumping of drips and the handling of drippage should be carefully watched from a safety standpoint, and also because of its nuisance to the public. It is desirable to store it all at one location, preferably the gas works, and it is bad practice to leave it standing in the wagon or truck over night. In large territories, a motor drip truck can be used to advantage, as it can cover more ground and get the drippage to the proper storage location each day. We have found that with the use of a power pump driven by the truck motor, the drippage is more economically and safely handled. A careful man should be selected for this work, and he should be impressed with the importance of keeping the public at a safe distance when pumping drips, especially the high-pressure ones.

Curb boxes and valve and drip boxes in the street are the cause of many accidents, and employees should be instructed to watch out for and to report any found in a dangerous condition. They are often bad tripping hazards if improperly installed. In selecting a type to be used, pay particular attention to the chance of the cover coming off. If this occurs in the larger sizes used in the street, accident may result from a person or a horse stepping in the opening. Such an accident occurred in our district a few years ago, the horse breaking his leg and the occupants of the carriage being thrown out and injured.

How the Gas Companies are Helping the Nation

L. H. Johnson, former superintendent of the Sheboygan Gas Light Company, of Sheboygan, Wis., is now in training at the Plattsburg, N. Y. camp.,

Stewart Swift, new business manager for the Rochester Light, Heat & Power Company, of Rochester, Minn., has recently resigned and is now in the military service.

Joseph M. Anensman, formerly of the United Gas Improvement Company, Philadelphia, is now a corporal, Groves Registration Service Unit 301.

A. E. Pierce, vice-president and general manager of the Wisconsin-Minnesota Light & Power Company, has resigned and is now an officer with the general army. He is succeeded by P. D. Kline.

P. W. Schurr, recently in the employ of the Western States Gas & Electric Company, of Stockton, Cal., has joined the newly organized "gas and flame" unit, which is slated for early service. He is a member of Commodore Stockton Camp, No. 4, United Spanish War Veterans and the Veterans of Foreign Wars. Mr. Schurr recently left for San Francisco, and expects to go to Washington shortly.

The Consolidated Gas Company of New York and its affiliated companies now have 878 of its employees in

(*Continued on page* 502)

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The Real Reward

Quite frequently the technical journal whose predominant ideal is to be truly and practically valuable to its readers succeeds in supplying them with an article that wins an approving nod of the head. Articles of such striking and pertinent value as to stir them to write to the journal enthusiastically commending it are not so frequently gotten hold of.

A recent article in the AMERICAN GAS ENGINEERING JOURNAL brought back, among others, such expressions as these: "Your first article in the Nov. 17 issue was great," and "The writer has been a constant student of gas engineering literature for many years, and feels thoroughly familiar with the published writings of our fraternity. It gives me great pleasure to say that, in my opinion, nothing has appeared in ten years on water-gas operation which could compare at all with the splendid article in your Nov. 17 issue.

"The writer at the present time is carrying on a campaign for the introduction of scientific practice with three 12-ft. sets, and the information given in this paper will be put into daily use."

These comments were received from men whose names are known throughout the gas industry.

The reason the article received so enthusiastic a reception was because it contained information of a kind that could be instantly applied to the advantages of the man and companies for whom it was intended. It was written by a gas engineer for gas engineers, and was an offering to others of the lessons his experience had taught him.

It is the practice of the JOURNAL to pay at an established rate for articles contributed to it for exclusive publication. Perhaps the amount paid this particular author compensates him for the actual time spent in the preparation of his article. But this is but an infinitesimal part of what he put into the article, for the information imparted is the fruit of more than a decade of active work.

Because his article had so real a value, because his ability to write it reveals the author as a well-grounded and alert gas manufacturer, and because its publication over his name brings these facts home to several thousand other gas men, such publication has undoubtedly an immense publicity value to its author; a value he did not seek, but which, nevertheless, will stand him in good stead in the future and make his path upward so much easier to travel.

But these advantages mean little to the engineer. Such returns as the statement: "The information given in this paper will be put into daily use," are the kind of returns he values most. The underlying motive of all engineering is the desire to serve, broadly, humanity, but especially his own kind, for thereby he insures that humanity will benefit to a greater degree through the

knowledge he has gained than it would if he reserved it for personal application.

It does not seem an exaggeration to say that hundreds of gas men will benefit directly through the information this author has imparted. The demand for extra copies of the issue that are coming in is a confirmation of this supposition.

Our experience with this article, and others we have published within the last twelve months, we deem a justification of the policy this JOURNAL has followed consistently during that period, and longer.

Persistently it has preached "writing" to the gas men it reaches. Not from them, but from others, the answer came back, "The gas man will not write." Openly and frankly we stated that a worth-while gas journal was an impossibility unless he did.

One of our contemporaries took exception to this attitude on the ground that it, particularly, already filled the bill. Our other principal contemporary remained silent, from which we inferred that it agreed with us.

The response to our efforts has convinced us that the industry realized the shortcomings in the journals that served it, and that it conceded that they were due in good part to the individual gas man himself.

The AMERICAN GAS ENGINEERING JOURNAL cannot with justice complain of any lack of co-operation on the part of the industry as a whole towards enabling it to better its service. It is convinced that the gas man realizes his responsibilities towards his journal, that he feels the need of a real service from it, and that he is willing to do his part towards the attainment of this end.

Tardy Activity on Rates

A contemporary in a recent issue brings us the surprising tidings that now is the psychological time for gas companies to seek higher rates. Perhaps it is for those few gas companies which did not perceive the need many, many months ago. Then, again, perhaps it isn't.

The AMERICAN GAS ENGINEERING JOURNAL doubts if there ever is a psychological time to seek increased rates. If there is, it is a time when money is plentiful and there is not much call for it. Money slips out of our coffers easily when they are overflowing. Money is plentiful now, but a good part of the public's surplus is going into war contributions. People who are buying Liberty Bonds on installments now are going to be richer eventually, but for the present, despite increased earnings, they are financially pinched.

We do know, however, that there are times when rate increases are imperative, whether they are taken pleasantly or not. When such times come increases should be sought, whether the time coincides with the psychological moment or not.

Such a condition began in the gas industry many months ago. Quite early in the present year considerable space in various issues of the AMERICAN GAS ENGINEERING JOURNAL was given over to a discussion of the subject. Then followed the early summer meeting of the American Gas Institute, and in the following months a large part of the weekly news section of the JOURNAL was occupied with reports of applications made, increases granted or refused and the general conditions consequent upon such activities.

We are glad, however that our contemporary has awakened to the need for relief in rates. It may be he can rouse such gas men, if there be any, who have been similarly drowsing and drifting towards disaster, to the fact that times have changed. Coal costs more than it did. So does labor. If it costs us more to make our gas than we sell it for, obviously we are losing money. There may yet be time for those who lagged with our contemporary to save themselves, but commissions move slowly. It would have been better had they started action when the companies of the kind that do not have to await the coming of the receiver to learn where they are heading did.

Holding Back New Business

We have commented previously in these columns on the actions of gas companies in discouraging new business, due to inadequate plant capacity and through an extremely short-sighted prejudice against running into reserves. Recently a new element that presents an aspect infinitely more alarming, since to a very considerable degree it is one that cannot be remedied within the gas industry, has obtruded itself into the new business situation. Many companies are shutting down on new business endeavors because of their inability to obtain coal.

That this condition will be remedied eventually no one can doubt. But there is an old saying anent the futility of closing the window after the bird has escaped. In the best interests, not merely of the gas industry, but of the nation, it should be remedied immediately.

In these times it is not good policy to retain on the payroll, even temporarily, employees who have no duties to perform. In those gas companies which are compelled to suspend new business efforts for a period, even of a very few months, the organizations of the commercial departments must perforce be disrupted.

When the fuel situation is relieved, the new business, even though it is pleading to be taken on, will not be easily gotten. The commercial department of the modern gas company is a more or less complex organization. Its duties consist of more than merely peddling appliances.

A big company without a man skilled in industrial work can accomplish little in that line, even though a market for a million cubic feet a day lies under its very nose. The office work of the average commercial department, with its classifications, listings, etc., plays a very large part in modern gas merchandising. Without some one available who knows how to use these classifications, listings, etc., they are not apt to serve a very useful purpose.

That the industry can look to the coal controller for whole-hearted co-operation is attested by his statements, quoted in the daily press, that the needs of the utilities will be met second only to the needs of transportation. This is just.

But the coal controller is handling a colossal task. He cannot be expected to be intimately conversant with the inner details of the gas business. It is possible that he does not appreciate the consequences to the industry of a very few months of relative uncertainty as to fuel supply to an extent that would prohibit campaigning for largely increased outputs.

It is the duty of the gas industry, not only to itself but to the nation, to bring these matters to his attention. It is to the best interest of the whole country that we preserve our new business departments relatively intact.

How the Gas Companies Are Helping the Nation

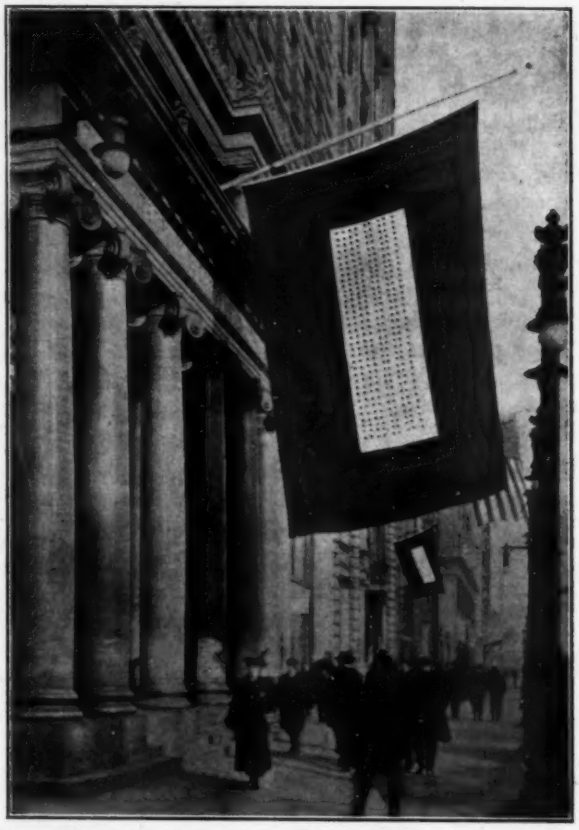
(*Continued from page* 499)

the war service of the United States. Many of the men who have gone to the front held important positions in various departments of the Consolidted Gas Company. the United Electric Light & Power Company and the New York Edison Company.

THE UNITED GAS IMPROVEMENT COMPANY recently unfurled a service flag showing 315 stars, representing the number of employees now in the national service. The flag measures 20 by 12 ft. and the stars are arranged in nine rows. In the Second Field Artillery there are 140 men from the company, most of whom were with the regiment, then the Second Infantry, as the "U. G. I. Company," on the Mexican border. In the Engineer Corps of the army there are twenty-six. Since this flag was made nineteen more men have been added to the honor roll. Others are expected to be called to the colors in the near future and space has been left on the flag for additional stars to represent them.

The following are the employees from the general office now in active service:

Name	*Command*
Lewis C. Bonsall	Naval Coast Defense Reserve Force
David J. Bullock, Jr.	Battery F, 2d Pa. Artillery
Langdon W. Clark	Naval Reserve Force
J. A. Davenport	Aviation Corps
Robert S. Dean	Quartermaster's Enlisted Res. Corps
James L. Doan	Aviation Corps
John Fortula	Navy
Norman B. Hart	Battery F, 2d Pa. Artillery



THE 315 STAR SERVICE FLAG DISPLAYED BY THE UNITED GAS IMPROVEMENT COMPANY AT PHILADELPHIA

William H. Hoffman	Battery F, 2d Pa. Artillery
Hubert V. Hothenall	Canadian Oversea Service
Alfred Johnson	Company E, 1st Pa. Engineers
Edward Kane	U. S. Army, Hospital Corps
William H. MacIlwain	Med. Res. Corps, Base Hospital No. 38
Louis J. Martin	Battery F, 2d Pa. Artillery
Joseph Matluk	Medical Dept., U. S. Army
Clarence J. Mengle	Aviation
Calvin Randolph	Headquarters Co., 1st Pa. Infantry
B. J. F. Stevens	Company E, 1st Pa. Engineers
Harry F. Summers	Battery F, 2d Pa. Artillery
Stanley M. Swartley	Quartermaster's Enlisted Res. Corps
Charles Tasker	Hospital Corps No. 10 (in France)
F. W. Wagner	Aviation
D. D. Weitz	Officers' Tr'n'g Camp, Ft. Oglethorpe
Lewis P. Yerkes	Camp Meade

RUFUS C. DAWES, president of the Dawes Gas Company, of Chicago, has given $2,000 to the Y. M. C. A. fund as an individual and $1,000 as president of the gas company. Henry W. Dawes, as treasurer of the company, also gave $1,000.

THE NORTH SHORE GAS COMPANY, with main offices at Waukegan, Ill., has given twelve employees to the military service of the nation. William A. Baehr is vice-president and consulting engineer of the company.

JESSE T. COFFEY, manager of the Junction City (Kan.) Gas Company, recently resigned and enlisted in the Engineer Corps at Camp Funston

Merchandising Gas

New House Heating Boiler on Market at Chicago

The Peoples Gas Light & Coke Company, of Chicago, has just put on the market of that city the Bryant Automatic Tubular House Heating Boiler manufactured by the Bryant Heater & Manufacturing Company, of Cleveland, Ohio. The appliance was first introduced to the Chicago public at the recent Home Exposition at the Coliseum.

Selling All-Gas Kitchens by Proving to Builders That They Make for Quick Sales of Houses

The Public Service Gas Company of New Jersey has made effective use of the fact that all-gas kitchens expedite the sale of new houses.

L. B. Barrett tells the story in *Service* as follows:

Two years ago this builder (we will call him Mr. Builder) erected in the fast growing section of Camden, some houses ranging in price from $3,000 to $3,500. These houses were equipped with coal ranges and combination coal and gas ranges.

In his next operation, similar in style and price to the foregoing, Mr. Builder again planned to use the coal and combination ranges, going so far as to provide cement hearth and flue openings. We wanted this business, but were at a loss to know exactly how best to obtain it. However, after a little thought in the matter, we decided that a trial installation would be our best step.

After securing the builder's permission, we placed a cabinet gas range and circulating gas water heater in the sample house of the operation. The appliances were delivered and set up only and the builder incurred no obligation whatsoever. Return privilege, in the event that purchaser of the house preferred a coal or combination range, was allowed.

This trial installation proved to be a great success, for within a comparatively short time after placing the "all-gas kitchen" in the sample house all the eleven houses were sold, each equipped with a gas kitchen. This naturally showed Mr. Builder the expedience of installing gas for cooking the year round. We have since secured orders from this builder for sixty cabinet gas ranges and gas water heaters, making complete gas kitchens.

It is needless to say that the small builders naturally follow in the footsteps of the larger fellow. We feel this trial installation was a large factor in our success of installing all-gas kitchens in 90 per cent of all new houses erected last year selling for $3,000 and over, saying nothing of securing orders for about 200 all-gas kitchens for new residences this year.

Direct Lighting Fixture Without Eye-Strain

In the Welsbach Gas Company Supplement just issued one finds an art glass bowl of the usual type, but which has some particularly fine merchandising features. A 6-in. circular portion at the bottom of ripple cathedral glass is one of them, through which a stream of downward light passes directly to

the table top or surface to be lighted. The more opaque portion protects the eyes from the direct light rays, and illuminates the ceiling and upper walls with all the soft, pleasing effect of semi-indirect illumination. In short, the "Windolite," No. 1206, bowl gives the downward illumination of direct lighting with all the eye comfort of a semi-indirect system. It contains the good points of both systems without disadvantages of either.

Hydro Pressure and Draft Recorder Catalog Issued by Bacharach Instrument Company

A highly interesting and instructive catalog covering the different types of "Hydro" draft and pressure recorders as manufactured by the Bacharach Instrument Company, of Pittsburgh, Pa., has just come off the press. This catalog D, as it is called, explains very comprehensively the design and construction of the various "Hydro" gauges, recorders and indicators and other automatic charting devices which have become so vital to modern gas plant management.

Three charts illustrate graphically the work of "Hydro" instruments in recording gas pressure on by-product coke ovens, open hearths, etc., draft as well as reversal of regenerative furnace, also in showing the ventilation records of mine fans, and the gas pressure in collecting main of a by-product coke-oven battery.

"Collections" the Principal Subject of Discussion at November Meeting of Gas Sales Association of New England

The Prepayment Meter as a Collector of Merchandising Accounts—Bonus to Employees to Keep Down Unpaid Balance—The Value of Collectors

At the Nov. 9 meeting of the Gas Sales Association of New England, there were forty-three present.

After the usual dinner was served, the meeting was opened by Governor Gould, who welcomed visitors from the National Commercial Gas Association and the New England Commercial Managers' Association.

Mr. Gould spoke of the importance, especially under present conditions, of all gas men getting together and exchanging ideas. We all need each others personal cooperative help.

Mr. Buckminster, of Fall River, then read a paper on "Collections," as follows:

"I do not presume to be an authority on the subject of collections; in fact, I was much surprised at our Governor for his suggestion that I present a paper before this association on a topic of such importance without my having previously disclosed some signs of qualifications.

"However, I am inspired somewhat by the selfish feeling that an effort on my part might bring about a discussion of value, and, secondly, we are now living in a critical era, when it is extremely essential for all of us to do our part towards helping to get the money back quick.

Collecting Data

"In order to collect data to use as a basis to work from, I requested information from several different gas companies.

"Their replies show very clearly what policies are being carried out in connection with this subject, which, for convenience, I have divided into three groups.

"I will try to analyze this collection of information a little further, and express my ideas from the viewpoint of one outside without showing any favoritism in the direction of the commercial department.

"The term 'collections,' as applied to the gas business, is affected by many other phases of the business.

Relation of Class of Consumers

"Let us start back to the topic of industries. The nature of the industries in a town has a great bearing upon the ease with which you are able to demand first payments and collect further instalments, and the theory of the effect this has on collections would obviously be, to my mind, at least, somewhat proportional to that of the nationalities.

"In a mill town the merchants necessarily have to cater to the majority, which in each instance is the operatives, a people earning a low wage, and accustomed to purchasing merchandise on the instalment or easy-payment plan. The consequent additional effort on the part of the collection department is self-evident.

"The employees of a town, which we have termed the middle class, receive a somewhat higher wage than the mill town operatives, and some families would own their homes. This condition would naturally bring more satisfactory results to the collection department.

Prepayment Meter as a Collector of Merchandise Accounts

"Last, we have the residential town, whose people would call for very little instalment business, but, on the other hand, desire their pur-

First	Second	Third
The mill cities, whose chief industry would be the manufacture of cotton or woolen goods, or both.	The middle class, where shoe shops, jewelry manufacturing and industries of similar class predominate.	The residential cities, such as the suburbs of Boston.
Nationalities— One-third foreign, 30 per cent foreign, 50 per cent foreign, 50 per cent foreign, 70 per cent foreign.	Cosmopolitan, one-fifth foreign, unknown 26 per cent foreign, one-third foreign, 20 per cent foreign.	.....
Regular meters— 80 per cent, 35 per cent, 98 per cent, 94 per cent, 73 per cent.	80 per cent, 60 per cent, 20 per cent, 80 per cent, 50 per cent, 40 per cent.	75 per cent.
Prepay meters— 20 per cent, 65 per cent, 2 per cent, 6 per cent, 27 per cent.	20 per cent, 40 per cent, 80 per cent, 20 per cent, 50 per cent, 60 per cent.	25 per cent.
Gas bills paid by check— 7 per cent, 35 per cent, small, 10 per cent, 5 per cent.	40 per cent (20 office and 40 collectors), 75 per cent, 43 per cent, 15 per cent, 25 per cent, 10 per cent.	.....
Bills mailed or delivered— Delivered, delivered, delivered, delivered, both.	Delivered, one-half mailed, 20 per cent mailed, delivered, delivered, delivered.	Both.
Collectors or notices— Notices, notices, both, both, both.	Notices, notices, both, collectors, notices, both.	Collectors.
Credit clerk— No, yes, yes, yes, yes.	Yes, yes, yes, no, yes, yes.	Yes.
Loss on gas accounts as charged off books— One-tenth of 1 per cent, one-fifth of 1 per cent, one-half of 1 per cent, less than 1 per cent.	One-tenth of 1 per cent, thirty-five one-hundredths of 1 per cent, three-tenths of 1 per cent, one-third of 1 per cent, 1 per cent.	One-fifth of 1 per cent.
Loss on merchandise accounts as charged off books— 1 per cent, 2 per cent, 5 per cent, less than 1 per cent.	One-third of 1 per cent, 1.1 per cent, one-tenth of 1 per cent, eighty-seven one-hundredths of 1 per cent, one-half of 1 per cent, one-fifth of 1 per cent.	One-eighth of 1 per cent.
Cash discount— Yes, 10 per cent, $1.00, 5 per cent, 5 per cent.	No, no, no, yes, 2 per cent, 10 per cent.	No.
Policy as regards shutting off meter or removal of merchandise in case of delinquents— Appliance removed, appliance removed, appliance removed, appliance removed, appliance removed.	Appliance removed, appliance removed, appliance removed, appliance removed, seldom removed, appliance removed.	Appliance removed.

Average City Wage—Present conditions in respect to the wage question are so changed from what they were previous to the beginning of the war that I do not believe it would be a fair criterion to go by; consequently, I have omitted this data.

Meter Indexing—The smaller sized towns naturally follow the old method of reading meters during a certain period and then allowing a stated number of payment days the first part of the month during which, if a customer paid his gas bill, he would receive the discount. The larger cities work under the continuous reading plan and, as a general rule, allow a number of discount days expiring on, say, the 10th, 20th or 30th of the month.

chases to be cash ten or thirty days.

"The prepayment meter has proved itself a sincere friend of the collector. The percentage of these meters used has its good effect in reducing the amount of work necessary to collect gas accounts, and we can call upon it to do still more—by painting it blue and changing the price gears in excess of the usual rate, many merchandise bills can be collected where otherwise they would be charged off as a loss, or at least require unnecessary expense to collect on or remove the appliance.

"While the rule does not always hold good that a poor-pay customer would have a prepayment meter, still I believe that in connection with delinquents the policy of exchanging a regular meter for a prepayment meter has been followed by most companies that have used the prepayment meter. Of course, we must expect to experience some difficulties with the prepayment meter in the nature of thefts and damage losses along with a slightly increased initial cost of the meter, but under conditions in the majority of cities, I believe this would be rather insignificant when compared with the improved results. Perhaps someone present will have more definite figures to offer on this subject.

"The percentage of customers paying their bills by check offers a basis of determining the class of customers that you are doing business with. This probably would not be a good criterion to go by in applying it to the city's population as a whole, but only to the individual person.

Value of Using Collectors

"From the previous information we find that only two employ collectors, five use notices, with perhaps one or two collectors to make adjustments or follow up customers who move to an unknown location, and perhaps assume a different name. Personally, I do not believe in the use of collectors, except in special instances, such as to locate a former customer, visit some particular person that you would not care to send a notice to, or where it was necessary to make an adjustment. Where notices have replaced collectors, the results have been, as a general rule, even more satisfactory, as, besides realizing a saving on the former cost of collectors, the delay in reaching a settlement has been reduced. It is so easy for a customer to offer some excuse to the collector that will delay the payment on the merchandise he is seeking to collect on. These excuses generally mean that he has to make several more trips before the money is finally obtained, whereas by the use of notices the customer has got to acknowledge it or expect to have his meter service discontinued or the merchandise removed.

"The same rule applies to sending an unnecessary number of notices to a delinquent customer. If he has previously been delinquent and knows that you send out three or four notices, he will, in most cases, wait for the last notice before making an adjustment. Two notices besides the shutoff notice will bring better results than three or four will, both as to getting the money in and reducing the lapse of time between the first and last notice.

Relation of Credit Clerk to Commercial Department

"Having previously been accustomed to having the commercial department decide as to the credit on merchandise sales, when I became connected with the Fall River company, I was rather skeptical as to what effect a credit clerk's decision might have on the volume of merchandise sales. I can now state, however, that I was unnecessarily alarmed, as the credit clerk has always been willing and ready to cooperate with the commercial department in cases where there was a question of credit, and, if possible, make satisfactory arrangements whereby the sale might be put through. The credit clerk acts as a safeguard against the acceptance of an order by an over-enthusiastic salesman, and I thoroughly believe that when doing business in a mill town after the type of Fall River it is very essential to have a credit clerk on the job all of the time.

"The loss on gas accounts as charged off books in all cases reported seems to be reasonably low. There might, however, be a question as to whether this represented the actual losses or whether they are being carried along on the books indefinitely. Some companies have a practice of charging off a bad account just as soon as they know it is uncollectable, which would seem to be a very logical method, as one would be only fooling themselves to continue the charge on the books.

"The same remarks could apply to the loss in connection with merchandise accounts.

Cash Discounts vs. Premiums

"There seems to be a great difference of opinion as to whether a cash discount or premium should be allowed customers. Some men argue that all classes should be considered equal in this respect; that is, the customer who has the money to pay cash should not have any financial advantage over a person of smaller means who necessarily had to make the purchase on the instalment plan. We have found that by offering a cash premium the cash sales have increased materially, and many customers who, at the time of the sale, only pay the first instalment, have come in the office within thirty days to pay the balance due, receiving the benefit of the discount.

"The cash discount is apt to be abused by our customers requesting discount after the end of the discount period. The cause of this is more apt to be from the fact that the customer did not receive a bill of goods promptly, and that he only had a few days in which to make the payment after the receipt of the bill, unless the bill has been dated at the time it is made out and the discount period figures from that date. Of course, we can argue that inasmuch as the merchandise has been taken from our stock room, the customer is receiving the benefit, and, therefore, should pay the bill within the specified time in order to receive the premium; but, unfortunately, the customers of a public service corporation, for the most part, look upon these conditions from a somewhat different angle; therefore, in order for us to eliminate one more possibility of discord, we should impress upon the bookkeeping department the importance of the order passing through the routine and the bill being mailed promptly.

Factors That Increase Collection Costs

"I might at this time mention some of the obstacles that either directly or indirectly tend to increase the cost of collections: The frequency with which most people move, causing an increased aggressiveness on the part of the collection department (we have removed on an average of 9,133 meters for the last three years). The

custom of foreigners to assume a different name every time they make application for a meter at a new location. The practice of accepting too small an amount down on the first payment of the sale of an appliance. The demand from every point for money. The high cost of living. The uncertainty of the immediate future.

"I will call your attention to a clipping entitled 'Soft Pedal on "Charge It",' that I cut out of the newspaper which applies to this subject and reads as follows:

"'A local department store discovered that its charge accounts were increasing in a manner out of proportion to its cash sales increase. The president did not take this situation for granted, but asked the reason. The credit man, after a little questioning, found the answer. It was the way in which the clerks closed the order. They invariably asked, "Shall we charge it?" or "Have you an account here?" With the instructions not to suggest to a customer that he open an account for his purchase and charge it, it was soon discovered that the increase in cash sales held up in better proportion than they had to the increase in charge sales.'

"The principle is there, and it could be enlarged and improved upon considerably. I am sure better results would be realized in our business if the clerk had said, 'The discount is well worth saving,' or 'At present we almost feel obliged to ask for cash on small purchases.' These suggestions could be elaborated on naturally.

Increasing Proportion of Cash Sales

"The present unusual conditions warrant that a special effort should be made to obtain more cash sales and reduce the outstanding.

"I hope that I can put this assertion in practice more each day, but I admit that it is much more difficult in a mill town.

"Some features that on the other hand help to promote the collections or increase the efficiency are the state of mind in which a customer has been left after the visit of the salesman or fitter.

"By allowing a cash discount or premium, and having the salesman impress upon the customer the advantage of saving this discount, particularly at this trying time.

"To require a larger first payment on appliances.

Free Maintenance

"The utilizing of the free maintenance men to inaugurate a good feeling toward the company. I am personally very strong on the free maintenance end of the business, and believe in educating these men to sell all types of merchandise, as well as give a service to gas appliances already in use. It is surprising to note the amount of mantles, glassware and miscellaneous lighting repair parts that our men dispose of during a month, and we cannot but feel with a degree of satisfaction that where these men have gone about putting lights in working order, they have made the customer satisfied, whereas, on the other hand, with two or three lights going bad in the house, the customer might delay the payment of a bill or feel disposed to replace gas with electricity, with a consequent loss to the gas company.

"The policy of requesting deposits has a distinctive bearing on this subject, as the customer feels a keen sense of value in the money that is held in abeyance on the settlement of his account, also the number of people owning their homes.

"It may be a fair statement to make that this is the proper time to discontinue instalment sales as much as possible, consistent with our business, and educate our customers along the cash-payment line. Such a change might reduce the sales, but, on the other hand, I have heard of one instance where a company has tried out this policy, and has actually had an increase in sales.

"In conclusion, I want to say that in every line and with every human being who has an ambition there is a goal to reach.

"What is our goal in reference to collections? The ideal or the next best to be obtained?

"Perhaps the discussion will answer this."

M. B. Webber opened the discussion. He spoke of his interest in Mr. Buckminster's method of classifying the cities and towns, and asked, "What is the general practice of companies represented by association members in removing meters when the customer moves? Do you remove them, or do you merely shut off the gas? Also, what proportion of a month's business is it necessary to have outstanding on the books?" In his own companies this varied widely, the unpaid balances running from 20 to 150 or more per cent of the previous month's gross business.

Methods as Related to Collections

Mr. Webber asked how much of this was reasonable. He felt that a great deal of good could be done in finding out what is told the consumer or what is, perhaps, not told the consumer, as he thought that there was a good opportunity to get in more money without increased expenses. For example, he cited a case where the proper wording of the conversation between the office clerk brought in more money than under the old methods.

Bonus for Reducing Unpaid Balance

One of the Webber companies has a bonus system, where the clerks in the office get a bonus if the unpaid balance is less than the previous month's business. These vary anywhere from $1.50 to $24.50. This has been in operation less than four months. The first month the clerks received a bonus of about 75 cents each. Last month they received over $4 each. The only chance seemed to be in the difference in what was said to the consumer when orders and payments were taken in. This bonus also applies to the meter reading. The meter reader does outside collecting in addition to reading meters. In figuring on some of the other companies, a proposition is to be made subject to revision every six months.

William Gould said that his company had figures on outstanding accounts per meter taken, at the same time the merchandise sales per meter, were taken into consideration.

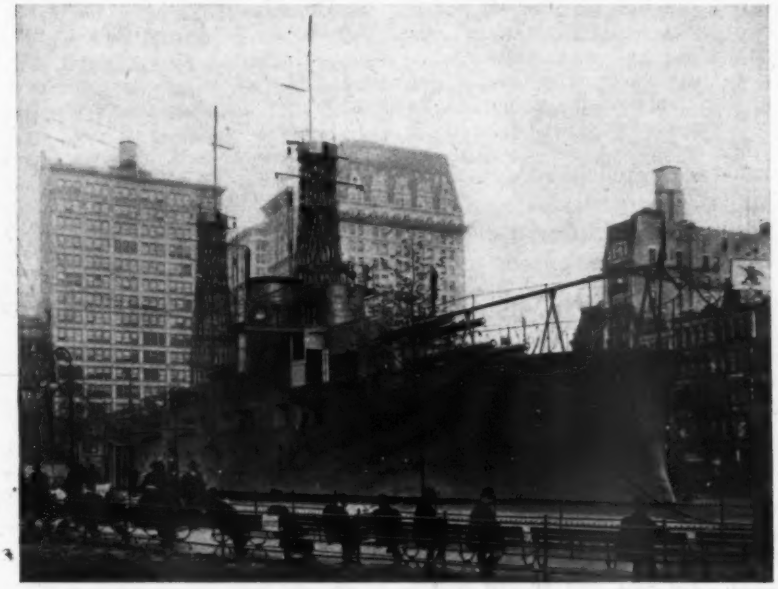
He felt that both were needed to be there in considering the amount outstanding, as a company which made no effort to push sales could easily have a smaller outstanding account per meter without any merit to such a company.

Speculative Accounts

F. A. Woodhead said that he thought we should not remove a meter for outstanding merchandise bills. Arlington had a rule that they would not place any prepay meter in cellars to which the general public

(*Continued on page* 508)

News of the Gas Industry



New York City Boasts of First Gas Heated Battleship

U. S. S. Recruit to be Kept Warm by Gasteam Radiators—Thanksgiving Dinner Cooked by Consolidated Gas Company Served on Board

New York boasts a battleship "launched" on May 30, 1917, on Union Square, which enjoys the double distinction of being the first battleship to see actual service on dry land, and also of being the first and only warship to be heated by gas.

To the passerby the good ship Recruit may seem just an empty hulk, but watching a few minutes will invariably show up some of its regular jackie crew somewhere on deck doing part of the inevitable polishing and scrubbing, or perhaps a door in the ship's hold will open and the navy band, consisting of thirty-six pieces, will start out on their morning or afternoon recruiting. Besides thirty-six band members there is a crew of fifty-five men detailed from Newport or other naval training stations, all of whom are leading as near a sea life as can be approximated with skyscrapers looking down upon them from all four sides.

Still, it doesn't take an unusual amount of imagination for a jackie to feel that he's on the ocean wave when he is continually under the same strict discipline as he will be when in actual service, performing the same scrubbing tasks, drilling at stated intervals and sleeping in a none too steady hammock at night.

The Recruit's main duty, of course, is to point the way to service in the navy, and it has been remarkably successful in its mission so far under the direction of Captain Charles A. Adams (who has charge of the navy recruiting station at 34 East Twenty-third Street), but incidentally it is offering a two months' post-graduate course to one group of jackies after another who make an intermediate sojourn on Union Square between training station and actual warship service.

The idea of this good ship, which affords training for men already enlisted and a touch of realism to those about to enlist, was evolved by the Mayor's Committee on Defense, and the money for its building collected by popular subscription. The Recruit is 250 ft. long and 45 ft. beam, and is a model of a United States dreadnought with a main battery of four 12-in. guns.

Until the middle of October the grounded vessel was warmed chiefly by the music of the band and general youthful exuberance, but as the last leaves in Union Square dropped away from the trees and chill blasts

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INTERIOR VIEW OF THE RECRUIT, SHOWING GASTEAM RADIATORS

"Collections" Discussed at November Meeting Gas Sales Association

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has access. Arlington physically removes every meter on change of consumer. He felt that it was hard to work out a satisfactory bonus system, because some months the proportion of sales on the instalment plan differed greatly from others. Because of the serious financial standing of public service companies in the eyes of the banking interests, it was now a question of gas companies not being able to borrow money, and of their being compelled to keep down the outstanding indebtedness as much as possible. Arlington delinquents are now being held to what they were June 30. Gas delinquents were not as serious as the appliance. For gas delinquents, they use notices, and have nowhere near as much trouble collecting their bills. Builders are hard pressed for money now, so most of the merchandise sales are made on recorded contracts, for it is most difficult for them to get money, and under the State law it is very difficult to collect from a builder if the contracts are not recorded.

Mr. Woodhead said that it pays to be especially careful in dealing with the builders in the vicinity of Boston at present.

S. A. Baker, the treasurer of the Fall River Gas Company, said that he was surprised to hear that all but two companies reported by Mr. Buckminster got along without collectors. He did not see how they could get along without them. If notices were used for collections, what would we do in non-receipt of notices? Would we take a chance or would we send out collectors? His experience has been that taking a chance and shutting off gas costs money. Fall River locks the meter. They do not remove it. A collector goes out on all cases of removing appliances. If the parties are to move in the early morning, he calls the night before, collects all outstanding indebtedness, plus about 100 cu. ft. more, to take care of consumption before they move. If they are to move later in the day, they are called on the first thing in the morning. Mr. Baker felt that it was difficult to figure on accounts outstanding or on sales per meter, because instalment sales were the greater proportion some months than others. Fall River had felt that a great deal depended on what stand was taken by the company, and how carefully rules and contracts were followed up.

This question was largely one of management. If the company felt that having an appliance in a house in use was worth more than collecting their money, the collection department must go slow; but whatever is the policy of the company, it should be carefully lived up to.

Complete Enforcement of Contract Agreements

Mr. Gould agreed that we all must carefully live up to our discount and notice dates, also to our sales agreements as signed. He felt that a great deal of the uncollectable accounts could be traced back to not carefully enforcing contract agreements.

C. C. Warren, attorney at law, who handles the collections for a number of Massachusetts gas companies, gave a few suggestions and experiences. He said that he felt that a manager of a gas company was in a very difficult situation. He was supposed to sell all the gas possible, and at the same time to get the pay for them, putting him between two fires. There were so many governing facts in a sale from contract which are impossible to foresee, that no matter how careful a manager might be, at times he would fall down.

One of the greatest assets is to have all the employees of the gas company, from the manager down, use extreme tact and politeness. We have to take a great deal of abuse from the public.

Losses Can Be Greatly Decreased

From the viewpoint of an attorney collecting the accounts, it was most important to have careful co-operation between the collector and the manager. In fact, from the whole force of the gas company. He felt that managers very often failed to appreciate the need of following up appliance sales on instalments. If the instalment collection is not carefully followed out, we almost invariably lose. We should always be sure to be on the spot when we have promised to call, carefully living up to our promises and expecting the consumer to do the same. He felt that in a great many cases we could get more collections in by personal contact rather than through letters.

C. C. Warren felt that if a collection side of the gas business was followed up as each one should be, losses would be greatly decreased. Keeping the good will of the public is a good point of view for gas managers, but sometimes we must raise antagonism in collections. We should not let this trouble us too much. There seems to be a story connected with a great many delinquent accounts. When the collector has the story he is greatly aided in collecting. He felt that gas companies were inclined to try too long to collect the bills with their own forces before turning them over to an attorney. He thought that the manager should watch the accounts very closely and not wait too long. The collectors should be watched carefully and kept up to the mark, as one of the hardest parts of business is the collection end, and unless the collectors are carefully followed up they are apt to be shirked.

Psychology in Collections

He felt that we should be very careful in removing meters for unpaid appliance bills, as there was some question as to our right to do it.

Mr. Gould said that it was not necessary to take out meters for unpaid appliance bills. The consumer could be watched very carefully for an opportunity to take out the meter for delinquent gas. Then when his foot slipped it was not necessary to replace the meter until the appliance account was paid in full. He said that prepay meters should show a greater increase in the business than regulars, because they get the money out of the consumers without their noticing it.

Harry A. Norton, of the Nathaniel Tufts Meter Company, said that he considered a sale was hardly a sale until it was paid for. It is very important that we get our money, especially so under the present conditions. He often wondered that prepay meters were not more used. The prepay meter originated in England for slow-pay or kicker accounts, and without the companies pushing the sale 30 per cent of the meters in England are of the prepay type. There is no doubt that the prepay meter does increase the sale of gas,

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Recruit Ship Heated by Gas

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struck the Recruit amidships there arose a necessity for heat. Accordingly, forty-three pressed steel gas radiators were installed, making the warship cosy and warm in every corner.

Since the installation of the radiators both officers and jackies are basking in genial warmth, and everything, from the paymaster's room in the bow to the wardrobe room in the stern, is full of the cheer that only comes with comfort and the right degree of heat.

Thanksgiving Day was particularly busy on the U. S. S. Recruit. Five hundred Thanksgiving dinners were served to as many navy recruits on board.

The Consolidated Gas Company lent their assistance by allowing the use of the large hotel ranges installed in their main building, Fifteenth Street and Irving Place. The dinners were then sent over to the recruit ship by means of the company's trucks.

Mrs. Chester, daughter-in-law of Admiral Chester, of the United States Navy, was one of those who took a prominent part in making this Thanksgiving dinner possible.

Robert E. Livingston, of the Consolidated Gas Company, of New York, said that Commander Charles Adams, U. S. N., and Acting Captain Charles F. Price, U. S. N., were both high in the praise of gas for heating. The Recruit has been kept as warm "as a battleship in a North Sea fracas" during the last few cold days and nights. The Consolidated Gas Company has done, and is now doing, a phenomenal business in the sale and installation of gas heating appliances. Gasteam radiators are now the sole heating dependency in residences and lofts, and in many entire large buildings. The company's corps of fitters, etc., has been over-burdened with the applications for the installation of heating appliances.

COLUMBIA GAS & ELECTRIC COMPANY and its subsidiaries, in its September report, shows that the company has come through the summer with a surplus after charges in each of these months for the first time in its history. The report shows a surplus of $142,292, as compared with a deficit of $24,260 for the same months last year.

Calumet, Mich., Company Submits Increase Data

Representatives of the Calumet Gas Company recently submitted to a joint conference of the Red Jacket and Laurium village councils data preliminary to a formal application for permission to increase the rates to consumers. The gas company, it is understood, is seeking to raise its rates from $1.40 per thousand cubic feet to $1.75, or $1.60 net, and in support of the request submitted information concerning other gas companies in various parts of the country that have raised their rates.

A statement showing the company to be operating at a monthly loss of $1,316.50, with average monthly receipts of $3,071 and expenses of $4,387.50, also was submitted.

No action was taken at the conference and the company was requested to submit a formal application to each council.

Application for San Jose, Cal., Increase Dismissed

Word has been received that the Railroad Commission of California has dismissed, at the request of the Pacific Gas & Electric Company, its application for authority to increase gas rates in San Jose and adjacent territory. The application to increase rates was made at the same time similar applications were put in for practically all the towns served by the Pacific Gas & Electric Company.

Engineer Selected for Seattle Investigation

Edward W. Bemis, of Chicago, gas engineer, will make an investigation of the books and accounts of the Seattle Lighting Company and appear as the principal witness for the city in a hearing on increased gas rates set by the Public Service Commission for Jan. 2.

The investigation to be made by Mr. Bemis and his services as a witness before the commission will cost the city $10,000, the amount appropriated by the city council not long ago.

The increased gas rates went into effect on Nov. 1, subject, however, to the result of the hearing fixed by the commission for Jan. 2, all amounts in excess of the rates finally fixed by the commission to be rebated to consumers.

Factories at Elyria, O., May Be Deprived of Natural Gas

Although there has not been any special date set for its going into effect, it will probably not be very long before the local factories will be forced to find other fuel than gas to operate their boilers, as a notice given out by the Citizens Gas & Electric Company reads to that effect.

The gas company has a contract with the factories of Elyria to supply them with gas from April 1 to Nov. 1, but has always tried, and will endeavor to supply them the year round, as the lack of fuel would probably necessitate the laying off of a great number of men.

The facts have been left up to the State Public Utilities Commission, which will act according to existing conditions in the future.

In case, however, the gas used by private consumers should demand a larger supply, then the gas company will be forced to deprive at least part of the factories of their fuel.

Temporary Rate Raise Asked at Watertown, Wis.

An increase in rates amounting to 20 cents per 1,000 cu. ft. has been asked by the Wisconsin Gas & Electric Company. Manager A. C. Babson, in explaining the increased cost, said in part:

"The company has applied to the State railroad commission for a slight temporary increase, which will not by any means be great enough to fully offset the increased expenses, but which may prevent an actual loss each month. The commission will investigate the claims of the company in detail, will take into account the actual present value of the plant and the costs of operation, and the company hopes it may temporarily be given some assistance in its endeavor to maintain a gas service for Watertown, Wis., which at no time has been profitable on account of the comparatively large investment required to serve the somewhat widely separated and limited number of customers."

THE SPRING VALLEY UTILITIES COMPANY has applied to the Illinois Public Utilities Commission for permission to suspend its gas service temporarily. The inability to obtain coal is said to be one of the reasons for the discontinuance of operations.

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though the payment without noticing the amount of money is made. He has often wondered that more campaigns are not collected through prepay meters set at a higher rate, and thought that the possibility of collecting appliances through the prepay meter, such as is done in England, has been overlooked.

RELATION OF THE HUMAN ELEMENT

Mr. Gould said that the human element in the collector entered into the consideration to a greater extent than we seemed to realize. The collector can make serious trouble for us, or he can make friends.

J. C. D. Clark, of the Boston Consolidated Gas Company, said that if a man purchases appliances on the instalment plan you cannot remove the appliance after a certain amount has been paid, but that if an appliance is sold on a rental plan the gas can be shut off for non-payment. In the Boston Consolidated the chief collector is the only man who can separate the appliance account from the gas account. He said that often an appliance account was not paid because some minor difficulty of adjustment of question regarding the appliance.

The Boston Consolidated writes off only about one-tenth of 1 per cent as loss on appliance sales. Speculative dealers or builders were sold appliances at the regular price less 10 per cent for cash. Mr. Clark said we should all read the paper by Robert Blair, of Chicago, read at the American Gas Institute convention in Chicago last year. Chicago always gets the names of two intimate friends of a new consumer, and could trace the consumer through these friends.

FIGURING BONUSES

M. B. Webber said that his companies kept the partial payment apart from the cash basis, and in figuring bonuses deducted the amount not actually due. He thought that we should go out after the amounts outstanding on partial payments by offering a special cash discount to aid us in getting in the money now.

William L. King, of Cambridge, asked why some companies lost as much as 2 per cent on their business. Mr. Buckminster suggested that it was undoubtedly on account of having so many consumers who were of the transient type, and moved out of town with appliances.

Fall River discontinued the locking of meters whenever the meters were scarce, and during that time removed them, but when they were plenty they were locked for a period of two months. It was moved and carried that the paper and discussion be printed and distributed to the members.

Mr. Gould then introduced a former gas man, First Lieutenant Norton McKean, adjutant of the Third Battalion, 302d Infantry, at Ayer.

Lieutenant McKean gave a very interesting discussion of the Plattsburg training of forces for the national armies. He then described the receiving of the drafted men at Camp Devens and their training. He said that the keynote to army training is discipline. It was moved and carried that Lieutenant McKean be adopted by the Gas Sales Association as its army representative.

The following members of the association were present at the meeting: Charles T. Aaron, Edward A. Willard, Thomas C. Savory, John W. Muir, H. Howard Smith, R. A. Fancy, James J. Coughlin, Howard B. Hall, George P. Smith, Jr., William Gould, W. T. Pease, R. Buckminster, Wm. H. West, J. C. D. Clark, S. S. De Vett, M. B. Webber, Fred K. Wells, Edwin F. Ripley, A. A. Wilbur, J. B. Anderson, D. D. Bond, Edward F. Burke, H. M. Tukesbury, T. H. Piser, William L. King, R. M. Thompson, F. A. Woodhead, C. E. Lasher, C. A. Young, C. W. Keefe, J. H. McPherson, A. E. Norton, H. A. Norton, Lieut. Norton McKean, M. E. Abbott, S. A. Baker, R. C. Champion, W. L. Hallett, M. L. Hatch, A. L. Hall, T. I. Fenno, L. W. Geffine, C. C. Warren.

GEORGE P. SMITH, JR.,
MANAGER OLD COLONY GAS COMPANY, EAST BRAINTREE, MASS.,
SECRETARY.

St. Albans, Vt., Company to be Reorganized

On request of a majority of the bondholders of the St. Albans (Vt.) Gas Light Company, represented by E. H. Gay, of Boston, demand has been made, the company having dedefaulted, that the People's Trust Company, of St. Albans, trustee, take possession of the property under the terms of the mortgage.

It is proposed by Mr. Gay and his associates to reorganize the company upon the approval of the Vermont Public Service Commission with a capital stock of $50,000 and make a first mortgage of $40,000 bearing 5 per cent interest and 5 per cent preferred stock, non-cumulative, of $25,000. The present company has a capital stock of $50,000, first mortgage 6 per cent bonds of $65,000.

York, Pa., Company Considering an Increase

That the York (Pa.) Gas Company expects to increase the service charge at least by Jan. 1 next was declared recently by Oscar Heckert, general manager of the company. Many of the gas companies throughout the State either have already advanced their rates or are planning to do so in the near future.

According to Manager Heckert, if the cost of labor and materials continues to increase, the company will be compelled to collect additional revenue in order to meet expenses. The company, it is said, will probably follow the example of the other gas companies in Pennsylvania, and instead of increasing the cost of consumption of gas would increase the service charge.

The following Pennsylvania artificial gas companies have filed increased rates with the public service commission at Harrisburg: Waynesboro Gas Company, Athens and Sayre Gas Company, Towanda Gas Company, Luzerne Gas & Electric Company (Kingston), Penn Central Light & Power Company, Bucks County Public Service Company, Lock Haven Gas Company, Highland Gas Company, Jersey Shore Gas Company, Easton Gas Works, Lebanon Gas Company and Stroudsburg Gas Company.

The present monthly rates in York are as follows. For the first 10,000 ft., $1.15 per thousand; for the next 10,000 ft., $1.05 per thousand; for the next 10,000 ft. 95 cents per thousand; for the next 20,000 ft., 85 cents per thousand; for the next 150,000 ft., 75 cents per thousand. If paid on or before the tenth of the month next following the consumption a discount of 5 cents per thousand feet is made. There is a 10-cent service charge.

Personal Notes

C. H. HODGES, who has been in charge of the Twenty-first Street works of the Consolidated Gas Company, of New York, resigned Nov. 1 to become general superintendent of the gas division of the Lehigh Navigation Electric Company, one of the companies of the Electric Bond & Share Company, of 71 Broadway, New York City. Mr. Hodges was graduated from St. John's College of Annapolis, Md., in 1900. After a year's employment at Cramp's Shipyard, Philadelphia, he went to the manufacturing department of the United Gas Improvement Company, under W. H. Gartley. He continued in this connection four years, leaving to become superintendent's assistant in the manufacturing department of the Consolidated. In his new connection he will be located at Lewisburg, Pa., and will have charge of seven plants.

O. M. HARTSHORN has recently been appointed secretary of the City Light & Water Company, at Amarillo, Texas. He formerly held a similar position with the Pueblo (Col.) Gas & Fuel Company.

W. F. DOELKER, manager of the appliance department of the Manhattan (Kan.) Gas & Electric Company, recently resigned this position to go into business for himself.

H. C. BLACKWELL is now with the Kansas City (Mo.) Light & Power Company as general manager. He was formerly with the Peoples Light Company, of Davenport, Ia., as vice-president and general manager, and with the United Light & Railway Company as gas engineer. He resigned both positions in order to accept this new appointment.

W. A. EHLERS, of the National Commercial Gas Association of New York, recently spent a few days in Port Arthur, Texas, doing some expert work for the Port Arthur Gas & Power Company.

C. B. BORDEN, of Marlboro, has been appointed superintendent of the Westboro (Mass.) Gas & Electric Company, to fill the vacancy caused by the resignation of Howard Hemenway, which was noted in the Oct. 6 issue of the AMERICAN GAS ENGINEERING JOURNAL. Mr. Borden has moved to Westboro and will begin his new duties at once.

E. R. WAITE has been appointed secretary of the Pueblo (Col.) Gas & Fuel Company. He was formerly with the Denver (Col.) Gas & Electric Company in the bookkeeping department.

ALBERT B. RACHT, formerly in the engineering department of the S. F. Bowser Company, has accepted a similar position with the Western Gas Construction Company. For more than five years he was connected with the Western company, working with the sales force in the engineering, boiler shop and other departments. He joined the staff at the Bowser plant seven months ago, but recently returned to the Western company to a more lucrative position.

A. B. WYNNE is now general manager of the Fremont (Neb.) Gas, Electric Light & Power Company. Prior to coming to Fremont he was superintendent of the Mansfield (Ohio) Electric Light & Power Company.

S. B. TUELL, manager of the Blackstone Valley Gas & Electric Company, Pawtucket, R. I., will leave in about two weeks, having joined the American International Corporation at Philadelphia, which has taken a Government contract to build shipyards and ships. He took up the management of the Pawtucket company about six years ago. Previous to this he held a similar position with the Stone & Webster Corporation in Florida, Indiana and Fall River. He is a member of the To Kalon Club, the Rhode Island Country Club, Providence Engineering Society and the National Electric Light Association. He is to report at Philadelphia, where the American International Corporation is shaping up plans for putting through its Government war contracts.

R. C. BROOKS, who has been connected with the Stone & Webster corporation for a number of years in Texas, and for the past six years has been in charge of the light and power department of the Dallas, Texas, lighting and railway property, will succeed S. B. Tuell as manager of the Blackstone Valley Gas & Electric Company, Pawtucket, R. I.

P. D. KLINE, who resigned on May 1 as general manager of the Ogden, Logan & Idaho Railway Company to accept a position as manager of the La Crosse district of the Wisconsin-Minnesota Light & Power Company, was on Nov. 15, promoted to the position of vice-president and general manager of the company, with headquarters at Eau Claire, Wis., succeeding A. E. Pierce, who is now in the National Army. Mr. Kline constructed and placed in operation the Ogden works and held the position of general manager for five years.

G. W. DRESSER has resigned his position as manager of the Goshen (Ind.) Gas Company. Mr. Dresser came to Goshen three years ago from the Warsaw (Ind.) Gas Light Company, where he had been manager for eight years. He has not as yet made plans for the future.

THE BAY STATE GAS COMPANY at its recent annual meeting of the stockholders elected the following directors: Thomas W. Lawson, J. Frank Allee, W. Harry Miller, E. A. McSweeney, J. V. McCommons, Newell Ball and S. John Abbott. The directors organized by electing these officers: President, Thomas W. Lawson; vice-president, J. Frank Allee; treasurer, W. Harry Miller; secretary, E. A. McSweeney.

HENRY STAUFENBERG, for twenty years connected with the Flatbush Gas Company, Brooklyn, N. Y., as a service inspector, died Nov. 21, at his home, 414 Midwood Street, at the age of seventy.

LAWRENCE T. MCKEOWN, for the past twenty-two years in the employ of the Brooklyn Union Gas Company, died Nov. 19, at his home, 451 Eighteenth Street, South Brooklyn, N. Y.

ALBERT H. VEGKLEY, of Jamaica Plain, formerly manager of the commercial department of the Boston (Mass.) Consolidated Gas Company, who will move to New York shortly, was given a banquet by 100 Jamaica Plain men in the Westminster Hotel recently. Mayor Curley presented him with a traveling bag on behalf of those present.

WILLIAM JOSEPH MINTON, employed for many years as a paymaster by the Standard Gas Company, died Nov. 6, in his forty-seventh year.

E. L. BRANDON has been appointed manager of the Central California Gas Company, Visalia, Cal., to succeed William Anson White.

G. J. SCHOENFELD recently went into business for himself in Philadelphia, under the name of the Service Equipment Company, handling second-hand industrial appliances. Mr. Schoenfeld was formerly with the United Gas Improvement Company.

J. H. PARDEE, president, and J. P. RIPLEY, railway engineer, of the J. G. White Management Corporation, New York City, are visiting the Philippine Islands, making a general inspection of the Manila Electric Railroad & Light Company and other interests in the Islands operated by the corporation. They are expected to return to New York City about Jan. 15.

Construction Notes

Empire Natural Gas System Extended by Large Purchase

Henry L. Doherty's holding company, Cities Service Company, has just completed a purchase from Eastern owners of the gas pipe lines, gas wells and gas leases of the American Pipe Line Company in the central part of the Osage reservation, as was announced at Bartlesville, Okla., recently. The purchase price has not been announced.

The property will be operated in connection with the other natural gas properties of the "Empire" system, which is now supplying the Kansas Natural Gas Company.

The deal just closed is one of the largest natural properties yet made in this part of the country. It includes the gas leases on 288 square miles or 184,328 acres of land.

This land, together with the pipe lines and wells already in service by this company, including 60,000,000 cu. ft. open flow in gas wells, will give an additional supply of about 10,000,000 ft. a day as soon as connections with the present properties can be made.

"This amount of gas will be increased as the tract is developed. We already have taken charge of the property, and arrangements have been made for its development," stated F. P. Fisher, who is in charge of the property.

The gas property just bought by Henry L. Doherty interests includes 50 miles of new pipe line, a large part of which is 12-in. pipe. There is but 2 miles of connecting line needed to connect this new, completed gas system with the heart of the present Empire system. This connection will be made at Cotton Valley Station.

A complete system of private telephone lines goes with the property.

Geological surveys have been made of the entire property. There are two distinct gas sands. One of these is found at about 600 ft. and the other at about 1,200 ft. In addition to the wells already in on the tract, very active work is to begin immediately in the drilling of many more wells.

Coke Plant Site in East St. Louis Chosen

L. E. Fisher, vice-president and general manager of the St. Louis Coke & Chemical Company, a subsidiary of the American Coke & Chemical Company, of Chicago, has announced that one of three proffered sites in the East St. Louis industrial district has been approved by a committee as a location for a large coking and iron reducing plant, and probably will be chosen by the board of directors of the company within ten days.

The company, he said, expects to make an ultimate investment of about $15,000,000 in its East Side plant, the first units of which will be completed early in 1919.

Coke and its by-products, including toluol and other explosives needed by the Government, will be produced in large quantities. Mr. Fisher estimated that the output of toluol alone will be 45,000 gallons a year. In addition to explosives, dyestuffs and tar, the company, he says, will produce from 15,000,000 to 18,000,000 cu. ft. of illuminating gas a day. The present consumption of gas in St. Louis, according to Mr. Fisher, is 20,000,000 cu. ft. a day.

When the plant is in full operation, Mr. Fisher said, it will produce steel at a cost which will be $2 a ton cheaper than it is now produced in Pittsburgh, and because of its central location the plant will have an advantage over Pittsburgh in freight rates to Western points.

A part of the company's plan is to use Illinois coal and Missouri iron ore in its coking and smelting processes. This will be the first attempt ever made to use Illinois coal in the manufacture of coke.

Canadian Steel Company to Install 25 More Wilputte Coke Ovens

The Wilputte Coke Oven Corporation, of New York City, has been awarded a contract for the installation of twenty-five Wilputte regenerative by-product coke ovens, with certain by-product equipment, as an extension to the present coke oven plant of the Algoma Steel Corporation, Ltd., at Sault Ste. Marie, Ontario, Canada. Work will be started immediately, and the construction is expected to be completed by July 1, 1918.

Improving Appearance of Providence Plant Surroundings

The Providence Gas Company is making a decided improvement to their plant on Hartford Avenue, the land being covered with a coating of rich loam, many trees set out and all to be enclosed with an attractive steel fence.

Gas Plant Contracts at Richmond, Va.

Superintendent W. P. Knowles, of the Richmond (Va.) City Gas Works, will hand into the administrative board shortly proposals received by him on two contracts. One is for the renewal of ten benches of "nines" and the other for a 10-ft. set of water gas apparatus, with foundations and connections. Bidders are requested to furnish blueprints and specifications for the work to be done.